

## Section 8 ECOLOGY

8.1	Introduction.....	4
8.2	Scoping .....	4
8.3	Legislation and Guidance.....	5
8.4	Planning Policy.....	6
8.5	Methodology .....	7
8.6	Field Survey Methodologies .....	7
8.7	Ecological Impact Assessment (EclA).....	12
8.8	Desk Study .....	15
8.9	Phase 1 Habitats and NVC communities (Site Survey).....	16
8.10	Groundwater Dependent Terrestrial Ecosystems (GWDTEs).....	20
8.11	Species (Site Survey).....	21
8.12	Assessment of Impacts .....	25
8.13	Mitigation .....	28
8.14	Statement of Significance Summary .....	32

### Tables

Table 8.1 – Scoping Responses

Table 8.2 - Guidelines for assessing the potential suitability of Proposed Development sites for bats, based on the presence of habitat features within the landscape

Table 8.3 – Minimum Survey Standards for bat surveys at proposed wind farm developments

Table 8.4 – Transects and Remote Detectors for Bat Survey

Table 8.5 – Approach for Evaluating the Value or Sensitivity of Ecological Receptors in Scotland

Table 8.6 - Definition of spatial effect magnitude on IEFs

Table 8.7 – Definition of temporal effect magnitude on IEFs

Table 8.8 – Significance Levels of Effects on Habitats and Species

Table 8.9 – Groundwater Dependency Scores

Table 8.10 – Cumulative Impacts of Wind Farms and other Developments within the NHZ

### Figures

Figure 8.1 - Survey Areas

Figure 8.2 - Phase 1 Habitat Survey

Figure 8.3a - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3b - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3c - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3d - Target Notes for north eastern area with Rue Gill Hill, Ewelairs Hill and Pot Hill

Figure 8.3e - Target Notes North western area including Dundoran Plantation

Figure 8.3f - Target Notes North western area including Dundoran Plantation

Figure 8.3g - Target Notes for south-eastern forest area including Silton Forest

Figure 8.3h - Target Notes for south-eastern forest area including Silton Forest

Figure 8.3i – Target Notes for additional areas survey in 2020

Figure 8.3j – Target Notes for additional areas survey in 2020

Figure 8.3k - Target Notes for additional areas survey in 2020

Figure 8.4 – GWDTE Within Excavation Buffers

Figure 8.5 - Routes of Bat Transects and Locations of Remote Detectors

Figure 8.6 - Fishing Survey Locations

Figure 8.7 - Otter Evidence (Non-Sensitive)

Figure 8.8 - Badger Evidence (Non-Sensitive)

Figure 8.9 - Red Squirrel and Pine Marten Evidence (Non-Sensitive)

### Appendices

Appendix 8.1 – Bat Activity Transect Routes

Appendix 8.2 – Bat Survey Dates, Times and Weather

Appendix 8.3 – Locations of Static Recorders, Dates and Times

Appendix 8.4 – Badger Sett Definitions

Appendix 8.5 – Fish Survey Locations

Appendix 8.6 – Designated Sites within 20 km of Scoop Hill

Appendix 8.7 – Desktop Results Habitats and Species

Appendix 8.8 – NVC Descriptions

Appendix 8.9 – Phase 1 Habitat Target Note Descriptions

Appendix 8.10 - Plant Species Lists

Appendix 8.11 – Results from Bat Activity Surveys

Appendix 8.12 – Results of Bat Records from Static Detectors

Appendix 8.13 – Total Number of Bat Passes per Month

Appendix 8.14 – Summary of Otter Evidence (non-sensitive data)

Appendix 8.15 – Summary of Badger Evidence (non-sensitive data)

Appendix 8.16 – Common Lizard Sightings

Appendix 8.17 – Results of Electrofishing Surveys

Appendix 8.18 – Important Ecological Features (IEFs) – Habitats

Appendix 8.19 – Important Ecological Features (IEFs) – Species

Appendix 8.20 – Dimensions used in Habitat Loss Calculations

Appendix 8.21 – Loss of Habitat Types

Appendix 8.22 – Developments within the Natural Heritage Zone

Appendix 8.23 – Residual Effects

Appendix 8.24a – Dryfe Water: Electrofishing Survey

Appendix 8.24b - Wamphray Water: Electrofishing Survey



## Glossary

Term	Definition
Cumulative effect	The combined effect of the assessed project in combination with the effects from a number of different projects, on the same single receptor/resource
Designated site	An area afforded protection under an International Convention, European Directive or a piece of UK legislation due to its nature conservation or landscape value.
Ecological Receptor	Includes any living organisms other than humans, the habitat which supports such organisms or natural resources which could be adversely affected by the development.
Effect	Term used to express the consequence of an impact. The significance of effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. Involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive, including the publication of an Environmental Impact Assessment Report.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Mitigation	Measures (which may include process or design) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development.
Remote Detector	Bat detectors left in situ over a number of days in strategic points to record bat activity.
Sensitivity	The extent to which a study subject can accept a change of a particular type and scale without unacceptable adverse effects.
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor.
Site of Special Scientific Interest	Sites providing statutory protection for the best examples of the UK's flora, fauna, or geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations.
Special Area of Conservation	Protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high - quality conservation sites that will make a significant contribution to

	conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended)
Special Protection Area	Sites providing statutory protection for a number of rare, threatened or vulnerable bird species and also for regularly occurring migratory species

## Abbreviations

Abbreviation	Description
ASSI	Area of Special Scientific Interest
BCT	Bat Conservation Trust
BTO	British Trust for Ornithology
DGC	Dumfries and Galloway Council
EclA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LBAP	Local Biodiversity Action Plan
MSS	Marine Scotland Science
NHZ	Natural Heritage Zone
NNR	National Nature Reserve
NVC	National Vegetation Classification
pSAC	Proposed Special Area for Conservation
pSPA	Proposed Special Protection Area
RSPB	Royal Society for the Protection of Birds
SAC	Special Area for Conservation
SEPA	Scottish Environmental Protection Agency
SNCO	Statutory Nature Conservation Organisation
NatureScot	Previously known as Scottish Natural Heritage (SNH)
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
ZOI	Zone of Influence

## Section 8: Ecology

### 8.1 Introduction

8.1.1 This section describes the Ecological Impact Assessment (EclA) of the proposed Scoop Hill Community Wind Farm development, as required by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. It does not include an assessment of impacts on the ornithology of the site, which is covered separately in Section 7 of this EIAR. Any sensitive locational information relating to badgers and otters is provided in a separate Confidential Annex due to the risk of persecution.

8.1.2 This EclA is based upon:

- An Extended Phase 1 Habitat Survey carried out by Starling Learning in 2018 and 2019;
- An NVC survey carried out by Starling Learning over the same period;
- Protected species surveys carried out by Starling Learning over the same period;
- Fish surveys carried out by the River Annan District Salmon Fishery Board which are for the Dryfe and Wamphray in summer 2018; and
- Existing records of protected habitats/species provided through consultation.

8.1.3 The aims of this EclA are to:

- Establish a robust and accurate ecological baseline for the site;
- Identify and evaluate the nature conservation/biodiversity interest present;
- Identify any potential impacts arising from the development proposals (construction and operational stages);
- Establish the magnitude and significance of those identified impacts;
- Identify mitigation measures to address the significant impacts;
- Assess cumulative impacts from other surrounding developments; and
- Assess any residual impacts and the need for any compensation.

### 8.2 Scoping

8.2.1 During the scoping stage of the EIA process, a Scoping Report was submitted to the Scottish Government (SG), Scottish Ministers and distributed to a number of statutory consultees including Dumfries and Galloway Council (DGC), NatureScot, Scottish Environment Protection Agency (SEPA), Marine Scotland Science (MSS), Community Councils and the Royal Society for the Protection of Birds (RSPB), to indicate the subjects to be covered within the EIAR. Scoping Responses relating to ecology were subsequently received from all parties, and a summary of their main comments is provided in the table below.

**Table 8.1 – Scoping Responses**

Consultees	Community Windpower Response
<b>Scottish Government</b>	
The proposed site is in close proximity to River Tweed Special Area of Conservation (SAC), Dryfe Water Site of Special Scientific Interest (SSSI), and NatureScot would expect measures are taken to assure no impact or significant effect on	Designated sites will be considered in the Environmental Impact Assessment with measures taken to ensure no significant impacts on them.

either.	
The mitigation measures suggested for any significant environmental impacts identified should be presented as a conclusion to each chapter. Applicants are also asked to provide a consolidated schedule of all mitigation measures proposed in the environmental assessment report, provided in tabular form, where that mitigation is relied upon in relation to reported conclusions of likelihood or significance of impacts.	All ecological impacts will be identified, and their significance assessed, mitigation will be put in place and any residual impacts discussed.
<b>Scottish Ministers</b>	
Core Paths - Access along these routes should not be restricted, diverted or closed.	Core Paths will be enhanced by the provision of signage providing information on the wildlife of the area.
There is potential flood risk including downstream at Wamphray and Newton.	The Habitat Management Plan (HMP) will include measures for bog enhancement, ponds and riparian planting of the headwaters of a number of watercourses and broad-leaved native tree planting on site. These measures will help to hold water on the site and reduce the risk of flooding.
Developer needs to manage surface runoff from the site during and after construction. Runoff should mimic that of existing conditions and not be increased.	The Construction and Environmental Management Plan (CEMP) will ensure robust measures are put in place to ensure run off is managed within best practice guidelines in order that run off and flood risk are not increased. All measures will also be detailed within the SEPA Construction Site Licence Application.
Developer should consider the rate of runoff into the watercourses which are located within the site. Any significant increase may increase the flood risk downstream.	
<b>Marine Scotland Science</b>	
MSS advises that the developer considers the following in the Environmental Impact Assessment. <ul style="list-style-type: none"> <li>• That salmon is listed under the European Habitats Directive and both salmon and trout are listed as priority species for conservation in the Scottish Biodiversity List. Furthermore, the River Tweed is a SAC, with the presence of salmon being a primary reason for this designation status;</li> <li>• That the results from site characterisation surveys for water quality (turbidity and stage data) and fish populations should be presented in the Environmental Impact Assessment Report (EIAR) along with detailed accounts of all proposed monitoring programmes;</li> <li>• The potential impact of felling on the water quality and aquatic biota and included in the water quality monitoring programme;</li> <li>• The potential cumulative impacts of adjacent wind farm developments on the water quality and aquatic biota; and</li> <li>• That the Tweed Foundation, River Tweed Commission, Annan District Salmon Fishery Board and River Annan Trust should be contacted, if not already done so.</li> </ul>	A freshwater ecology survey will be undertaken by an appointed consultant to establish the freshwater ecological baseline in the watercourses surrounding the development area and in order for CWL to understand the potential impacts on the ecosystems. As part of the consultation process for Scoop Hill Community Wind Farm, CWL will look to consult with local fishery boards to ensure the impact of the development is kept to a minimum.  The Gatecheck stage 1 report stated: "Fish ecology and habitat reports have been undertaken by the River Annan District Salmon Fishery Board."
<b>Scottish Environmental Protection Agency (SEPA)</b>	
SEPA highlighted the need for the provision of detailed	Community Windpower subsequently met with SEPA

<p>information on the presence of peat at the site in the form of a peat management plan which details the quantities, types and proposed reuse of the disturbed peat, the strategy for any forest felling (any reuse of forestry waste must be justified in terms of delivering increased biodiversity/ habitat), the identification of any Private Water Supplies and the source of any stone required for the provision of new site access tracks.</p> <p>A plan was requested showing how and where any timber residues will be re-used for ecological benefit within that area, supported by a HMP.</p>	<p>on the 18<sup>th</sup> December 2019 to discuss their exact requirements and the specifics set out in SEPA’s Scoping Response. CWL noted the information requirements and committed to address the points raised in the EIAR including:</p> <ul style="list-style-type: none"> <li>• The preparation and submission of a draft outline CEMP;</li> <li>• The preparation and submission of a PMP;</li> <li>• an assessment of GWDTE including a map of GWDTEs and a table with their description;</li> <li>• A dedicated forestry chapter that will include the assessment of PWS and include details of key-hole felling and replanting; and</li> <li>• Information on borrow pits and the quality of the stone within them as SEPA are keen to establish if they are suitable.</li> </ul> <p>A site specific Pollution Prevention Plan and all other associated documentation would need to be provided post consent as part of the Site Construction License to be agreed and approved by SEPA.</p>
<p><b>NatureScot</b></p>	
<p>NatureScot has been in discussion with the consultants who are currently undertaking the ornithological survey work on behalf of CWL and are broadly satisfied with the scope and methodologies that have been adopted. The site is large and complex and NatureScot accept that there may be difficulties in obtaining ideal coverage. The assessment will need to take account of any limitations.</p> <p>We have also had direct correspondence on the scope of protected species surveys. We note that the scoping document does not make mention of an assessment of either red squirrel or pine marten, which we understood were to be considered given that many of the turbines are proposed within forestry. If these species have been scoped out due to more up to date information confirming absence from this area, this should be made clear.</p> <p>With respect to bats, we note that the guidance listed in section 7.2.1 does not make reference to the most recent joint guidance - Bats and Onshore Wind Turbines, Survey Assessment and Mitigation – January 2019. Any survey protocols should be designed with reference to this guidance.</p> <p>We are happy with the scope of survey work with respect to other ecological receptors. All surveys should follow recommended methodology. The Scoping Report identifies the close proximity of the River Tweed Special Area of Conservation (SAC) to the north of the proposal site. Whilst we believe that there is unlikely to be connectivity between the development and the SAC and the conclusion may well be one</p>	<p>The coverage has been quite good despite difficulties. It will be ensured that the assessment takes account of any limitations.</p> <p>Red squirrel and pine marten surveys will be carried out using recommended methodology.</p> <p>Much of the bat survey was carried out in 2018 prior to the 2019 document being released. However, the surveys carried out are within the scope of this guidance, and it was ensured that those carried out in 2019 followed the new guidance.</p> <p>Designated Sites will be considered within the EIA and measures taken to ensure no negative impacts.</p> <p>Meetings have been held with NatureScot to discuss methodology and results.</p>

<p>of no likely significant effect, we would expect this to be considered as part of the EIA process.</p> <p>The development boundary also surrounds Dryfe Water Site of Special Scientific Interest (SSSI), designated for its upland mixed ash woodland. In spite of the close proximity of the site to the SSSI we do not anticipate any major effects, but nonetheless will expect that necessary measures are taken to assure no impact on the SSSI, particularly during construction.</p>	
<p><b>North Milk Community Council</b></p>	
<p>NMCC drew attention to the following matters which relate to the ecology of the Scoop Hill development site:</p> <ul style="list-style-type: none"> <li>• Dryfe Water SSSI (see:- <a href="https://sitelink.nature.scot/site/544">https://sitelink.nature.scot/site/544</a>);</li> <li>• Potential increase in water run-off into watercourses during both the build and operational phases;</li> <li>• Such occurrences potentially increasing the risk of flooding for those communities further;</li> <li>• Downstream of the River Dryfe (e.g. Sibbaldbie residents) which are already have existing flooding issues; and</li> <li>• No mention is made of the management of bio-hazards during the build, e.g. Chalara die-back/ash, <i>Phytophthora ramorum</i>/larch.</li> </ul>	<p>CWL responded to say that the Designated sites will be protected, and a flood risk assessment will be undertaken as part of the EIA work. CWL also confirmed that mitigation measures will be put in place and agreed with SEPA, NatureScot or the Local Authority as required.</p> <p>Chalara die back is already widespread in the Ash trees throughout this area. The wind farm is unlikely to make any further significant difference. There is very little larch in the area so <i>Phytophthora ramorum</i> spread should not be an issue. However, this organism can also affect oak and bio hazard control will be considered within the EIA.</p>

### 8.3 Legislation and Guidance

#### Legislation

8.3.1 The following legislation has been taken into account when undertaking this assessment:

- Environmental Impact Assessment Directive 2014/52/EU;
- Wildlife & Natural Environment (Scotland) Act 2011<sup>1</sup>;
- The Wildlife and Countryside Act (as amended) (WCA) <sup>2</sup>;
- The Conservation (Natural Habitats, &c) Regulations 1994 (as amended) ('The Habitats Regulations') <sup>3</sup>;
- The Conservation (Natural Habitats & c) Regulations 1994, as amended in Scotland (The Habitat Regulations);<sup>4</sup>

<sup>1</sup> The UK Government (2011). *Wildlife & Natural Environment (Scotland) Act. 2011*. Available at: <http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

<sup>2</sup> The UK Government (2011). *Wildlife & Natural Environment (Scotland) Act. 2011*. Available at: <http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

<sup>3</sup> The UK Government (1994). *The Conservation (Natural Habitats, &c.) Regulations. 1994*. Available at: <http://www.legislation.gov.uk/uksi/1994/2716/contents/made>

- The Nature Conservation (Scotland) Act 2004 (as amended)<sup>5</sup>;
- The Protection of Badgers Act 1992 (as amended)<sup>6</sup>;
- Wild Mammals (Protection) Act 1996<sup>7</sup>;
- The Convention for the Conservation of European Wildlife and Natural Habitat (The Bern Convention) 1979;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the 'Habitats Directive')<sup>8</sup>;
- Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life (the 'Freshwater Fish Directive')<sup>9</sup>, transposed into Scots law by the Surface Waters (Fish life) (Classification) (Scotland) Regulations 1997<sup>10</sup>;
- Council Directive 2000/60/EC ('Water Framework Directive')<sup>11</sup>, transposed into Scots law by the Water Environment and Water Services (Scotland) Act 2003 (the WEWS Act)<sup>12</sup>;
- Salmon and Freshwater Fisheries Act 1975<sup>13</sup>;

- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003<sup>14</sup>; and
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 ('the 2017 EIA Regulations')<sup>15</sup>.

### Guidance

8.3.2 Relevant nature conservation policy or guidance that gives rise to locally-designated sites and habitats and species of conservation interest, as detailed in this assessment, include:

- The Institute of Ecology and Environmental Management (2006) Guidance for Ecological Impact Assessment in the United Kingdom;
- Scottish Executive Guidance on European Protected Species, Development Sites and the Planning System (Scottish Executive, 2001);
- Scottish Planning Policy (Scottish Government, 2010);
- PAN 58: Environmental Impact Assessment (Scottish Executive, 1998);
- PAN 60: Planning for Natural Heritage (Scottish Executive, 2000);
- The Consolidated Scottish Planning Policy Statement 2010;
- UK Biodiversity Action Plan;
- Scottish Biodiversity List;
- A Handbook on Environmental Impact Assessment, NatureScot, 2018;
- Bat Surveys for Professional Ecologists – Good Practice Guidelines produced by Bat Conservation Trust, 2016;
- Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation, produced by NatureScot *et al.*, January 2019;
- Chartered Institute of Ecology and Environmental Management (CIEEM); Guidelines for Ecological Impact Assessment in the UK and Ireland, 2018;
- Dumfries and Galloway Local Biodiversity Action Plan 2009; and
- Dumfries and Galloway Council Local Development Plan 2 (LDP2) 2019.

<sup>4</sup> The Conservation (Natural Habitats & c) Regulations 1994, as amended in Scotland (The Habitat Regulations). Available at <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations>

<sup>5</sup> The UK Government (2004). *Nature Conservation (Scotland) Act (as amended). 2004*. Available at: <http://www.legislation.gov.uk/asp/2004/6/contents>

<sup>6</sup> The UK Government (1992). *Protection of Badgers Act. 1992*. Available at: <http://www.legislation.gov.uk/ukpga/1992/51/contents>

<sup>7</sup> The UK Government (1996). *Wild Mammals (Protection) Act. 1996*. Available at: <http://www.legislation.gov.uk/ukpga/1996/3/contents>

<sup>8</sup> European Council (1992). *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna. 1992*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101>

<sup>9</sup> European Council (1978). *Council Directive 78/659/EEC on the Quality of Fresh Waters needing Protection or Improvement in order to Support Fish Life (the 'Freshwater Fish Directive'). 1978*. Available at: <http://rod.eionet.europa.eu/instruments/210>

<sup>10</sup> The Scottish Government (1997). *The Surface Waters (Fishlife) (Classification) (Scotland) Regulations. 1997*. Available at: <http://www.legislation.gov.uk/en/uksi/1997/2471/regulation/7/made>

<sup>11</sup> European Council (2000). *Council Directive 2000/60/EC, establishing a framework for the Community action in the field of water policy ('Water Framework Directive'). 2000*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060>

<sup>12</sup> The Scottish Government (2003). *Water Environment and Water Services (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/3/contents>. [Accessed 14/09/2015]

<sup>13</sup> The UK Government (1975). *Salmon and Freshwater Fisheries Act. 1975*. Available at: <http://www.legislation.gov.uk/ukpga/1975/51>

## 8.4 Planning Policy

8.4.1 The Scottish Planning Policy (SPP) sets out details of national planning policy and includes the requirement for an appropriate assessment by the planning authority on any development plans or proposals which are likely to have a significant effect on natural sites, which include Special Protection Areas (SPAs), designated for their bird interest and Ramsar sites.

8.4.2 Dumfries and Galloway Planning Policy is captured in the Local Development Plan (LDP2) and includes the following policies:

<sup>14</sup> The UK Government (2003). *Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/15/contents>

<sup>15</sup> The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended). Available at <http://www.legislation.gov.uk/ssi/2000/320/contents/made>

**NE5: Species of International Importance**

Development proposals that would be likely to have an adverse effect on a European Protected Species will not be permitted unless it can be shown that:

- There is no satisfactory alternative;
- The development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; and
- The development would not be detrimental to the maintenance of the population of the species at a favourable conservation status in its natural range.

**NE6: Sites of National Importance for Biodiversity and Geodiversity**

Development that affects Sites of Special Scientific Interest, not designated as International Sites, and other national nature conservation designations will only be permitted where:

- It will not adversely affect the integrity of the area or the qualities for which it has been designated; or
- Any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

8.4.3 There is one site with a statutory designation within the development, the Dryfe Water SSSI, an upland mixed ash woodland with botanical interest.

8.4.4 All statutory designated sites within 20km of the site boundary are described in Appendix 8.6. The River Tweed SAC, the Moffat Hills SAC, Shiel Dod SSSI, Lochwood SSSI, Lochmaben Lochs SSSI, Castle Loch SSSI, Perchhall Loch SSSI, and Black Loch SSSI are all considered within this EIA.

**8.5 Methodology****Desk Study**

8.5.1 A desktop study and consultation exercise was carried out in 2017, prior to any fieldwork, to collate existing background information on the ecology of the site. This included a search for statutory and non-statutory sites designated for their nature conservation value, records of protected or notable species within the site or surrounding habitats, which could be impacted by the scheme and habitats or features of interest. The search area for protected species records was determined by the particular species and ranged between 1km and 10km from the site boundary. The following data sources were consulted:

- NatureScot - Sitelink map;
- Forestry Commission Scotland Land Information Search;
- National Biodiversity Atlas (NBN Atlas) (only for scoping, no records from this site are included);
- SEPA;
- South West Scotland Environmental Information Centre (SWSEIC);
- The Carbon and Peatland Map. NatureScot 2016;
- The Amphibian and Reptile Conservation Trust;
- The Tweed Foundation;
- The River Tweed Commission;
- The Annan District Salmon Fishery Board;
- The River Annan Trust;

- Relevant Environmental Statements, associated documents and bird monitoring reports for developments included in the Cumulative Assessment (acquired from various sources); and
- Aerial photography.

**8.6 Field Survey Methodologies****Field Survey areas**

8.6.1 A series of habitat and species surveys were undertaken to inform this assessment, taking place from September 2017 through to October 2019 with some additional visits in 2020.

8.6.2 All of the ecology surveys were carried out by Starling Learning, except for the electrofishing surveys of the Dryfe Water and Wamphray Water which were undertaken by the River Annan District Salmon Fishery Board in summer 2018.

8.6.3 The surveys carried out by Starling Learning are listed below:

- Phase 1 habitat survey;
- National Vegetation VC;
- Bats;
- Badgers;
- Otters;
- Water voles;
- Red squirrels;
- Pine martens;
- Reptiles; and
- Amphibians.

8.6.4 Incidental records of other species such as butterflies were gathered during the field surveys and during the ornithology surveys which were also undertaken by Starling Learning.

**Phase 1 Habitat Survey Methodology**

8.6.5 The Phase 1 Habitat Survey followed the standard methodology described in 'Guidelines for Baseline Ecological Assessment'<sup>16</sup>, which augments the methods described in the 'Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit'<sup>17</sup>. Aerial photographs were used to inform the field survey and photographs taken in the field were also used to help define the boundaries between the different habitats.

8.6.6 Each habitat was classified in the field and its extent mapped onto ordnance survey maps (1:25,000). Notes were made in the field relating to dominant plants, their associates, structure of vegetation or points of general conservation/ecological interest, including the presence, or potential presence of notable or protected species on the site. Botanical taxonomic nomenclature follows that of Stace<sup>18</sup>.

<sup>16</sup> Spon. E & FN. Institute for Environmental Assessment (1995). Guidelines for Baseline Ecological Assessment.

<sup>17</sup> Joint Nature Conservation Committee JNCC (2010). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC, Peterborough

<sup>18</sup> Stace. C (1997). *A New flora of the British Isles*. Cambridge University Press, Cambridge

8.6.7 An area based on a 500m buffer round the turbines has been used as reference for discussion of habitat loss due to the wind farm infrastructure. That area is presented as a Phase 1 habitat survey map over which the infrastructure can be viewed. Standard Phase 1 survey codes are used.

8.6.8 Also included in the mapped area is ground within 100m of access tracks that are well outside the core turbine site. Additionally, some of the mapped area includes ground surveyed for earlier iterations of the wind farm design based on different turbine locations. This ground has been retained to give a better view of the continuity of habitats. Some marginal areas have been omitted that were not visited during the survey, either due to difficulty of access or to late changes in the turbine locations.

**National Vegetation Classification (NVC) Survey**

8.6.9 An NVC survey was undertaken which included identification of wetland habitats that might include Groundwater Dependent Terrestrial Ecosystems (GWDTes).

8.6.10 NVC community names are attached to each habitat polygon throughout the survey buffer round the wind farm infrastructure and a specific map is available that enables the infrastructure to be viewed overlying the NVC communities, with a buffer of 250m around deep excavations, such as borrow pits or turbine bases, and a buffer of 100m around shallow excavations, such as access tracks or temporary construction compounds.

8.6.11 The survey included consideration of GWDTes as outlined in Land Use Planning System SEPA Guidance Note 4 (LUPS GU4) and a discussion of likely impacts on these communities as a result of the development and ways in which these impacts could be mitigated. GWDTes are discussed later in Section 8.10.

8.6.12 The habitat surveys were carried out by Keith Watson of Starling Learning.

**Protected Species Surveys**

8.6.13 A number of surveys for protected species were carried out and the methodologies are described below.

**Bat Survey Methodology**

8.6.14 Surveys were based initially on the methodology recommended for onshore wind farms within the Bat Conservation Trust (BCT) Bat Surveys: Good Practice Guidelines 2016<sup>19</sup>, and in 2019 on Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation<sup>20</sup>, the DEFRA report Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management<sup>21</sup> and Eurobats - Guidelines for consideration of bats in wind farm projects<sup>22</sup>.

8.6.15 Field bat surveys aimed to gather information on:

- Location of roosts and swarming sites that may be affected by the development;
- The bat species assemblage using the site;
- Location and extent of commuting and foraging;
- The amount of bat activity on site and its spatial and temporal distribution; and
- Bat activity and the use of the site by bats.

8.6.16 This was achieved by a number of survey methods:

- Potential roost survey searches;
- Bat activity surveys following transects to assess use of the site. These included listening posts; and
- Remote bat surveys using static bat detectors.

8.6.17 A survey area with a minimum buffer of 200m rotor radius was assessed for roosting potential for bats prior to activity surveys using aerial photos followed by ground truthing. All potential roost sites including trees and buildings were plotted on a map and their proximity to the wind farm considered. All woodland areas within the survey area, and/or mature trees where applicable, were assessed for their potential to support roosting bats. This involved undertaking a field visual survey, using close focussing binoculars, from ground level to identify any potential features that may be of value to roosting bats. Buildings with potential for roosts were also checked. A description of these categories is provided in Table 8.2. Trees and buildings were classified with a view to carrying out emergence surveys on those with roost potential and likelihood of being affected by the development.

8.6.18 Table 8.2 is replicated from the BCT Guidelines 2016<sup>23</sup> and details factors to consider in determining survey effort and site risk.

**Table 8.2 – Guidelines for assessing the potential suitability of Proposed Development sites for bats, based on the presence of habitat features within the landscape**

Suitability	Description of Roosting Habitats	Description of Commuting and Foraging Habitats
Negligible potential	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low potential	A structure with one or more potential roost sites that could be used by bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other similar habitat.  Suitable, but isolated habitat that could be used by small numbers of foraging bats such

<sup>19</sup> Hundt L. (2016) Bat surveys – Good Practice Guidelines (3<sup>rd</sup> Edition). Bat Conservation Trust, London.

<sup>20</sup> Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (2019). NatureScot, Natural England et al

<sup>21</sup> University of Exeter (2010). Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management. DEFRA

<sup>22</sup> Rodrigues L. et al (2014). Guidelines for consideration of bats in wind farm projects. Eurobats

<sup>23</sup> Hundt L. (2016) Bat surveys – Good Practice Guidelines (3<sup>rd</sup> Edition). Bat Conservation Trust, London. Table 4.1

	maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate potential	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back to gardens.  Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High Potential	A structure or a tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, protection, shelter conditions and surrounding habitat.	Continuous high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broad-leaved woodland, tree lined watercourses, and grazed parkland. Site is close to and connected to known roosts.

- 8.6.19 There is low potential for roosting within the large survey area. The habitats are mainly either high, open moorland or conifer plantation, most of which is young, immature or recently felled. Those habitats have generally little or no potential for roosting bats. The only known roost, located at Finniegill, indicated to the survey team by the resident of the property.
- 8.6.20 The main foraging habitat is along the watercourses and forests (edges and canopy). There are other areas such as the lower-lying farmland (such as around the farms at Laverhay, Kirkhill and Leithenhall and the two habitations at Finniegill) and the Black Esk Reservoir where foraging habitat could be considered of better value for foraging bats. However, these are largely outside the development area and bats are unlikely to be affected.
- 8.6.21 Therefore, the suitability for bats was generally taken as **moderate potential**.
- 8.6.22 Table 8.3 details minimum survey standards recommended for onshore wind turbine development replicated from the BCT Guidelines 2016 and amended to include the 2019 guidance.

**Table 8.3 – Minimum Survey standards for bat surveys at proposed wind farm developments**

	Site Risk Level (taking into account factors detailed in Table 8.2)		
	Low risk	Medium risk	High Risk
<b>Roost surveys</b>			
<b>Selection of roosts requiring further survey</b>	If evidence of roosting by medium or high-risk species and/or roosts of district importance and above (see Table 8.2) is found, further survey should follow SNCO guidance and guidelines where possible		
<b>Activity surveys</b>			
<b>Survey area*</b>	Up to 200 m+ rotor radius from turbine locations or potential turbine locations		
<b>Ground level transect surveys</b>	One visit per transect each season (spring, summer and autumn)	One visit per transect each month (April-Oct)	Up to two visits per transect each month (April to October)
<b>Automated surveys at ground level 2016 Guidance</b>	5 consecutive nights for each single or pair of locations within the survey area, per season	5 consecutive nights for each single or pair of locations within the survey area, per month	Up to 2 sets of 5 consecutive nights for each single or pair of locations within the survey area, per month
<b>Automated surveys at ground level 2019 Guidance</b>	Minimum level of pre-application survey required using static detectors is 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October).		
<b>Automated surveys at height** 2016 Guidance</b>	For surveys undertaken from masts (met mast or other) survey effort is as outlined above for surveys at ground level.		
<b>Automated surveys at height** 2019 Guidance</b>	Should be considered for additional information if possible, especially if other surveys indicate regular activity at height, or if existing infrastructure allows or of a met mast is present.		

\*This should include potential turbine locations plus the nearest habitat features likely to be used by bats

\*\* Essential in addition to ground level surveys if keyholing

- 8.6.23 The site risk level for all survey locations was regarded as **MEDIUM** risk. The large survey area was divided up into sample areas based on habitat types as well as geographic coverage. The health and safety dangers to staff crossing difficult habitat in darkness, limited survey coverage to an extent, however the level of survey at each survey location is shown in Table 8.4 below.

**Table 8.4 – Transects and Remote Detectors for Bat Survey**

Location	Transects for activity surveys	No. of static detectors
Dundoran and Broadfield Height area	One transect per month	4
Laverhay Height area	One transect per month	4
Gillesbie area	One transect per month	4
Silton Forest area	One transect per month	6
Three Mullach Hill area	One transect per month	4
Rue Gill Hill and Black Hill area	One transect per month	4
South Loch Fell area	One transect per month	4

### Roost Surveys

- 8.6.24 The established roost at Finniegill was surveyed in spring and summer 2019. An emergence and re-entry survey was undertaken of the property by three surveyors surrounding the house, in such a way as to cover the likely roost features and watch the emergence exits and re-entry points reported by the resident, and in such a position as to watch an adjacent outbuilding.

### Automated surveys at ground level

- 8.6.25 The automated surveys involved the use of remote bat detectors Songmeter SM2BAT+ and AudioMoth. In 2018, these were placed in a variety of sites including forest edge and forest rides, and on moorland adjacent to turbine locations. A total of 30 remote detector locations were used. The static recorders were left in place for five consecutive nights each month to record all bat activity during that period, which was later analysed using either Analoop or Kaleidoscope Pro software.
- 8.6.26 The placement of the static detectors was adjusted to respond to changes to the wind farm layout or to supplement data as and when those became available. After initial surveys (and transects) were undertaken in the Dundoran and Broadfield Height area, the turbines in that area were withdrawn from the design. Consequently, the programme of survey was terminated for that area. Further changes were made to the turbine layout in later summer, with additional turbines being proposed in the South Loch Fell area. Static detectors were placed in that area in 2019 to give coverage of the months from June to August. Static detectors were also placed in the Three Mullach Hill area in 2019 to provide additional information concerning foraging by bats from the roost at Finniegill.
- 8.6.27 Additional supplementary information in the Dryfe Water area was collected in a one-off experimental use of AudioMoth recorders. These were placed at three locations along the Dryfe Water valley (beside the culverts at NY 17074 99840 (near Dryfehead Bothy) and NY 17321 97206 (near Finniegill road end) and at the trackside at Duncan's Cleuch.
- 8.6.28 The locations of the static bat detectors are detailed in Appendix 8.3 and shown on Figure 8.5.

### Automated surveys at height

- 8.6.29 At each site one of the recorders was mounted on a guyed post at a height of 3m in order to better record high flying bats. This took place at one location for each of the forestry sites surveyed.

### Walked transect surveys

- 8.6.30 Transect surveys to assess bat activity were carried out. The evening (commencing before sunset) or dawn (commencing before sunrise) surveys consisted of two surveyors walking each of the transect routes through the wind farm development area including visiting many of the turbine locations. The primary aim of these surveys was to add to the data collected by the automated surveys to establish the presence of any bats in the area and any key foraging areas or commuting routes. Given the large size of the site, the difficulty of covering the ground within the available time, and the weather constraints, some transects made use of the forestry access tracks for drive-round surveys. The routes are detailed in Appendix 8.1 and are shown on Figure 8.5.
- 8.6.31 All transect surveys were carried out between the months of April and October 2018 and undertaken in suitable weather conditions (i.e. avoiding heavy rain, heavy wind and dusk temperatures below 10°C) as far as possible. Dates, times and weather during the surveys are detailed in Appendix 8.2.

- 8.6.32 Evening surveys commenced at approximately 15 to 30 minutes before sunset and lasted for a minimum of two hours each night. Dawn surveys began at 1.5 hours before sunrise. The primary aim of the activity surveys was to log any potential roosts, foraging areas and any commuting routes. When a bat was detected during the survey, the time, species, activity (emerging, foraging or commuting) and direction of flight (where that could be seen) were recorded. Surveyors used Echo Meter Touch units connected to Apple iPads or Batbox Duet or Batbox Baton detectors connected to digital audio recorders (Zoom H2). Subsequent analysis of recordings was performed using Kaleidoscope Pro or Batscan software.

- 8.6.33 Surveyors stopped at regular listening posts along each route for five-minute periods to listen for bats. There was a minimum of ten listening posts on each transect.

- 8.6.34 Bat surveys and the placement and collection of static detectors were carried out by Jamie Manners, Alan Wood, Davy Galbraith, Liam Flynn, Diane Lyons, Liz Parsons, Dougie Irving, John Speirs, Karen McCaul and Seumas Harris of Starling Learning.

### Otters

- 8.6.35 The site was searched for any signs of otter, which included tracks, spraints, couches, lie ups, feeding remains and potential holts in accordance with guidance provided by Macdonald *et al* (1998)<sup>24</sup>.
- 8.6.36 Surveys were carried out on watercourses and ponds, with efforts focused on any features likely to be attractive for finding spraints and feeding remains. Prints were searched for in suitable substrates. Periods of heavy rainfall and high water levels were avoided for the surveys, to ensure that signs had not been washed away.
- 8.6.37 The site has a number of watercourses considered suitable for otters, including the Dryfe Water and its tributaries, including The Caple, Waterhead Burn, Finniegill Burn and Cocklaw Burn, and the Wamphray Water and its tributaries such as the Glengap Burn. Surveys continued up minor watercourses that feed the aforementioned waters and also included a survey buffer around watercourses that could be impacted by the potential main site access routes. The otter's main prey of fish and amphibia is present throughout the site (see fish survey data in Appendix 8.24).
- 8.6.38 The locations of any field signs were recorded using a handheld GPS device. Non-sensitive results are shown in Appendix 8.14 and on Figure 8.7. Details of holts and other protected structures are provided in the Confidential Annex.
- 8.6.39 Otter surveys were carried out by Joe Greenlees, Alan Wood, Liz Parsons, Diane Lyons, Jamie Manners, Liam Flynn and Davy Galbraith of Starling Learning.

### Water Vole

- 8.6.40 Water vole surveys were carried out in conjunction with the otter survey following the accepted methodology described in the Water Vole Conservation Handbook<sup>25</sup>. This involves searching for

<sup>24</sup>McDonald et al. 1998. Proposals for future monitoring of British mammals. Department of the environment, Transport and the Regions, London.



characteristic signs of water vole presence, such as droppings, latrines, feeding stations, burrows, runways in vegetation and footprints.

- 8.6.41 Each watercourse was surveyed by two recorders; one in the water and one on the bank and any signs of water vole were recorded using a handheld GPS device.

### Badgers

- 8.6.42 The scoping survey noted widespread use of the site by badgers.
- 8.6.43 Surveys were carried out at each turbine location (and connecting habitat where possible to provide information on the ground over which likely access tracks would run) during winter months when vegetation is lower. Surveys were also conducted along the route of potential wind farm main site entrances and access tracks to help inform decisions on locating these features. Each location and up to 1 km from the site boundary, was searched for any signs of badger activity such as setts, either single isolated holes or a series of holes likely to be interconnected underground; faeces and latrines, scratching posts, usually at the base of trees; footprints, hairs, foraging and diggings signs and well-defined trails. Any evidence of badgers was recorded using a GPS device.
- 8.6.44 All setts identified were classified according to the widely used definitions shown in Appendix 8.4.
- 8.6.45 Badger surveys were carried out by Joe Greenlees, Liz Parsons, Diane Lyons, Alan Wood, Jamie Manners, Liam Flynn and Davy Galbraith in accordance with recommended guidelines<sup>26</sup>.

### Red Squirrel

- 8.6.46 Red squirrels are known to be common in the area (NBN Gateway and observations from scoping survey).
- 8.6.47 An assessment of the carrying capacity of red squirrels on site was carried out by means of a combination of transects for visual evidence and static monitoring in key locations utilising hair tubes and camera traps at feeding stations. The locations are given in Appendix 8.3.
- 8.6.48 Recommended guidance by Gurnell *et al* was used.<sup>27</sup>

### Pine Marten

- 8.6.49 Pine marten is known to be present in the area<sup>28</sup> which is recognised as an area experiencing active expansion in population. Pine martens were assessed using the recommended ten transects per hectare

(10x10km) technique (Cresswell *et al.*, 2012<sup>29</sup>). In addition, hair tubes and baited camera traps were used in the same locations as the red squirrel tubes.

### Brown Hare and Mountain Hare

- 8.6.50 Hares were not surveyed for specifically. There were many casual records of brown hares noted from other surveys and while the surveyors were driving through the site on the forestry access tracks. There were no sightings of Mountain Hare.

### Fish

- 8.6.51 The fish surveys were carried out to primarily assess the densities of juvenile salmonid species of fish present in the watercourses within the site. The salmonid species targeted are juvenile Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*). Although the fisheries surveys do not target non-salmonid species they are captured as a matter of course during these surveys. Other species typically found in watercourses within the Wamphray and Dryfe parts of the catchment include eel, stone loach, minnow, lamprey, stickleback and grayling. Of significance to any construction project, will be the presence of lamprey or eel due to their protected status.
- 8.6.52 The fish survey was undertaken using the methodology and record sheets developed by the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Tweed Foundation.
- 8.6.53 Electrofishing was employed, using backpack apparatus powered by a double 12v lead-acid battery with a variable voltage output. A smooth direct current was used at all sites. The backpack is linked to a cathode of braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.
- 8.6.54 The electrofishing uses semi-quantitative single pass methodology. A current is passed through the water, that temporarily modifies the fish's behaviour, resulting in the fish swimming towards the anode where it is intercepted by netting and placed in a holding container. The fish is anaesthetised using an approved anaesthetic and identified. Selected species are then measured and recorded.
- 8.6.55 Juvenile salmonids are measured to the nearest millimetre in order to enable age determination of individual fish into two basic categories. These categories are formally termed as '0+ fry', denoting young fish that have hatched in the same year as the survey, and '1++ parr', denoting young fish following their first winter.
- 8.6.56 After recovery, the fish is returned unharmed to the area from which it was captured.
- 8.6.57 An assessment is made at each site to grade the instream habitat for 1++ parr-stage salmonids into five categories: none, poor, moderate, good, or excellent. SFCC protocols were followed regarding the recording

<sup>25</sup> Strachan, R. and Moorhouse (2006/2011). *Water Vole Conservation Handbook*. English Nature, the Environment Agency & the Wildlife Conservation Research Unit, Oxford.

<sup>26</sup> Hutchison, I. (2009). *Scottish Badgers-Windfarms-Policy Statement*. Scottish Badgers; and Harris S., Cresswell P & Jefferies D. (1989). *Surveying Badgers*. Occasional Publication of the Mammal Society.No.9, Mammal Society Bristol.

<sup>27</sup> Gurnell J, Lurz P, McDonald R and Pepper H (2009) Practical Techniques for Surveying and Monitoring Squirrels. Practice Note. Forestry Commission, Edinburgh

<sup>28</sup> NatureScot Commissioned Report No. 740. Distribution of the pine Marten (*martes martes*) in Southern Scotland in 2013. <https://www.vwt.org.uk/wp-content/uploads/2015/04/croose-e-et-al-2014-distribution-of-the-pine-marten-in-southern-scotland-in-2013.pdf>

<sup>29</sup> Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehwella, W.J., Wells, D. & Wray, S. 2012. UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation. Southampton, UK: The Mammal Society.

of percentage estimates of depths, substrate type and flow type. Also, percentage estimates were made of the quantity of bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation.

8.6.58 A total of 18 carefully-chosen sites were surveyed: eight sites along the Dryfe Water and associated tributaries, and the remaining ten along the Wamphray Water and its tributaries. The fish survey team worked its way over the length and width of the chosen area, systematically examining all watercourse with the selection.

8.6.59 Full details of the fish surveys are given in Appendix 8.17 and maps of the survey locations are provided in Figure 8.6.

8.6.60 The fish surveys were undertaken by T. Donnelly, A. Gillan and C. Stones, who are all River Annan District Salmon Fishery Board (RADSF) staff accredited by the SFCC.

**Reptiles**

8.6.61 All records of reptiles were recorded during ornithological and other surveys.

**Amphibians**

8.6.62 All records of amphibians were recorded during habitat, protected species and ornithological surveys.

**8.7 Ecological Impact Assessment (EclA)**

**General**

8.7.1 This EclA is carried out in accordance with the guidance set out in the Institute of Ecology and Environmental Management (IEEM) Guidelines for Ecological Impact Assessment (2006)<sup>30</sup> and Guidelines for Ecological Impact Assessment 2nd Edition (2016)<sup>31</sup>. This section defines the methodology used to assess the significance of effects through the process of an evaluation of the sensitivity (a combination of Nature Conservation Value and Conservation Status) and the magnitude of effect.

8.7.2 In order to accurately assess the potential impacts likely to occur from the development of the wind farm, the baseline conditions of the site need to be established which ecological features (habitats, species, ecosystems and their functions/processes) are likely to be affected by the proposal, both within and adjacent to the development area.

8.7.3 There are a wide range of criteria which will determine the sensitivity of each ecological feature. Examples include:

- Any site designations;

- Naturalness;
- Rarity of habitat, plant and animal species;
- Habitat diversity and connectivity;
- Habitats and species in decline; and
- Large populations or concentrations of species considered uncommon or declining in a larger context.

8.7.4 The Nature Conservation Value is defined on the basis of the geographic context given in Table 8.5 below, which follows the guidance detailed in CIEEM 2016<sup>31</sup>.

**Table 8.5 – Approach for Evaluating the Value or Sensitivity of Ecological Features in Scotland**

Sensitivity of Receptor	Examples (Guidance to evaluation)
International	An internationally designated site or candidate site (SPA, pSPA, SAC, pSAC, Ramsar site, Biogenetic Reserve). A viable area of a habitat type listed in Annex I of the Habitats Directive, EU 1992 or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. it is a UK Red Data Book species or listed as occurring in 15 or fewer 10 km <sup>2</sup> in the UK (categories 1 and 2 in the UK Biodiversity Action Plan (BAP)) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring, nationally significant population/number of any internationally important species.
National (Scotland)	A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Any regularly occurring population of a nationally important species, which is threatened or rare in the region or county (see local BAP). A regularly occurring, regionally or county significant population/number of any nationally important species. A feature identified as of critical importance in the UK BAP.
Regional (Southwest Scotland)	Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10 km <sup>2</sup> in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation. A regularly occurring, locally significant number of a regionally important species. Sites, which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County (Dumfries and Galloway)	Semi-natural ancient woodland greater than 0.25 hectares (ha). County/Metropolitan sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including

<sup>30</sup> CIEEM (2006) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute of Ecology and Environmental Management, Winchester

<sup>31</sup> CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

	Local Nature Reserves selected on County / metropolitan ecological criteria (County/Metropolitan sites will often have been identified in local plans). A viable area of habitat identified in LBAP. Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan “red data book” or BAP on account of its regional rarity or localisation. A regularly occurring, locally significant number of a County/Metropolitan important species.
District (Western Southern Uplands)	Semi-natural ancient woodland smaller than 0.25 ha. Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile. District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on District/ Borough ecological criteria (District sites, where they exist, will often have been identified in local plans). Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource. A diverse and/ or ecologically valuable hedgerow network. A population of a species that is listed in a District/Borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation. A regularly occurring, locally significant number of a District / Borough important species during a critical phase of its life cycle.
Local	Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood, e.g. species rich hedgerows. A regularly occurring but low number of locally common protected species within or adjacent to the Development area. Local Nature Reserves selected on Parish ecological criteria.
Very local	Areas of habitat that have a limited ecological value. Plant assemblages tend to be species-poor but may be utilised by a small number of faunal species. Those habitats that have an effect of enriching and complimenting the local natural environment to a small degree.
Negligible	Areas of habitats considered to be of very limited ecological value. They are not representative of natural habitats and are very species poor. Those habitats that do not enrich the local natural environment.

- 8.7.5 Those ecological features identified to be potentially affected by the development and deemed to be of local importance or above, are termed ‘Important Ecological Features’ (IEFs).
- 8.7.6 Designated sites can be readily assigned to an appropriate level. For example, a site with a designation assigned through European legislation, such as a Special Protected Area (SPA) or a Special Area of Conservation (SAC), would be considered of International significance, a SSSI designated by UK statute would be of National significance and a site designated by a Local Authority would be of District importance. Where a feature has value at more than one level, its overriding value is that of the highest level. However, some sites may be designated for different features at the European and National levels, so these features should be valued accordingly.
- 8.7.7 The assignment of undesignated features, such as Biodiversity Action Plan (BAP) habitats and species, or areas of ancient woodland, may not fall clearly into the designations as described above. Therefore, a

number of other criteria are used to assess the nature conservation value of a defined area of land. Accepted criteria are set out in ‘A Nature Conservation Review’ (Ratcliffe, 1977)<sup>32</sup>, and include diversity, rarity, naturalness, intrinsic appeal, typicalness and recorded history.

- 8.7.8 Features, which have no ecological value in themselves, may still be regarded as important if they serve an ecological function, such as acting as a buffer against negative effects, or enabling the effective conservation of a more valuable area. This also applies to features, which aid the dispersal, migration and genetic transfer of species such as rivers, small woods, ponds, hedgerows and field boundaries.
- 8.7.9 Impacts may be defined as direct (e.g. direct habitat loss or destruction of an otter holt) or indirect (e.g. disturbance during construction or change in habitat suitability due to run off or impeded drainage).
- 8.7.10 The IEEM guidelines set out the process for assessment in the following stages:
- Description of the ecological baseline i.e. results of fieldwork and desktop study;
  - Identification of IEFs, i.e. the species of ecological value within the zone of influence;
  - Determination of the nature conservation value of the IEFs;
  - Identification of the potential impacts due to construction, operation and decommissioning of the development on the IEFs;
  - Determination of the magnitude of impact on the IEFs taking into account the sensitivity of the receptor and the duration and reversibility of the impact;
  - Determination of the significance of the impact based on the interaction between the magnitude/duration, the nature conservation value and the likelihood of the impact occurring;
  - Identification of mitigation measures to reduce or avoid negative impacts;
  - Determination of the residual impact following mitigation; and
  - Identification of any monitoring requirements.

**Magnitude of Effect**

- 8.7.11 The magnitude of effect refers to the level of changes in the extent and integrity of the ecological feature. A definition of ecological integrity is given within the Scottish Executive Circular 6/1995 (2000)<sup>33</sup> stating, “*The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*”. Although this applies specifically to European designated sites such as SACs, it is applied to wider countryside habitats for the purpose of this assessment.
- 8.7.12 Determining the magnitude of any likely effects requires an understanding of how the ecological feature will respond to development during and after construction. The effects can be adverse, neutral or beneficial.
- 8.7.13 Effects on IEFs can be judged in terms of magnitude in space and time. Magnitude refers to the scale of the impact. This may relate to the loss of a breeding population or the displacement of an individual species.

<sup>32</sup> Ratcliffe, D. 1977. *A Conservation Review*. Cambridge University Press.

<sup>33</sup> Scottish Executive (2000). Nature Conservation: implementation in Scotland of EC Directives on the conservation of natural habitats and of wild flora and fauna and the conservation of wild birds (The Habitats and birds Directives). Revised guidance updating Scottish Office Circular no. 6/1995. Accessed via: <http://www.scotland.gov.uk/library3/nature/habd-00.asp>

- 8.7.14 Magnitude is assessed at five levels for spatial effects as shown in Table 8.6.
- 8.7.15 Magnitude is also assessed at five levels for temporal effects, as shown in Table 8.7. Duration is defined as the time for which the impact is expected to last before recovery.

**Table 8.6 – Definition of spatial effect magnitude on IEFs**

Negative Effect Magnitude	Description
Very high	Total or almost complete loss of the receptor. Loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether. The conservation status of the receptor would be affected Guide: <20% of population remains
High	Result in large scale, permanent changes in the receptor and likely to change its ecological integrity. These effects are likely to result in overall changes in the conservation status of a receptor. Guide: 20-80% of population lost
Medium	Include moderate scale, long-term changes in a receptor or larger scale temporary changes, but the integrity of the receptor is unlikely to be affected. This may mean that there are temporary changes in the conservation status of the receptor, but these are reversible and unlikely to be permanent. Guide: 5-20% of population lost
Low	Include effects that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes to the conservation status of a receptor. Guide: 1-5% of population lost
Negligible	No perceptible change in the ecological receptor. Guide: 1% of population lost

**Table 8.7 – Definition of temporal effect magnitude on IEFs**

Duration	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as above 26 years) except where there is likely to be substantial improvement after this period.
Long term	Between 15 and up to (and including) 25 years.
Medium term	Between 5 and up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.
Negligible	No effect.

**Determining Significance of Potential Effects**

- 8.7.16 The significance of potential effects is determined by considering the value of the receptor and the magnitude of the effect and using professional judgement as to whether the integrity of the receptor will be affected.

- 8.7.17 Effects are more likely to be considered significant where they affect species of a high conservation value or where the magnitude of the effect is high. Effects considered not significant would apply to situations where the receptor is of a low conservation value, the integrity is not threatened, or the magnitude is low.
- 8.7.18 In accordance with the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant. The significance levels of effect on habitats and species are described in Table 8.8. Effects resulting in detectable changes in the conservation status of regional populations of Nature Conservation Importance are automatically considered to be significant effects for the purposes of the EIA Regulations (i.e. no distinction is made between effects of “major” or “moderate” significance). Non-significant effects include all those which are likely to result in small to barely detectable (minor) or non-detectable (negligible) changes in conservation status of regional (and therefore national) populations.

**Table 8.8 Significance Levels of Effects on Habitats and Species**

Significance Level of Effect	Description
Major	Detectable changes in regional populations of Nature Conservation Importance that would have a severe impact on conservation status.
Moderate	Detectable changes in regional populations of Nature Conservation Importance that would likely have an impact on their conservation status.
Minor	Small or barely discernible changes that would be unlikely to have an impact on the conservation status of regional populations of Nature Conservation Importance.
Negligible	No or non-detectable changes in the conservation status of regional populations of Nature Conservation Importance.

**Frequency and Timing**

- 8.7.19 The number of times an activity occurs will have an impact on ecological features. The timing too is significant if the activity takes place during a critical period e.g. when birds are nesting.

**Reversibility**

- 8.7.20 An irreversible effect is one from which recovery is not possible within a reasonable timescale or if there is no possibility of action being taken to repair it. A reversible effect is one where recovery can take place or can be reversed by mitigation.

**Assessment of Cumulative Impacts and Effects**

- 8.7.21 NatureScot (2012) Cumulative Assessment is used to inform the cumulative assessment, and the assessment of effects for surrounding developments will be taken into consideration as part of this.

### Assessment of residual impacts

- 8.7.22 If a potential impact is determined to be significant, mitigation measures to avoid, reduce or prevent the impact are suggested wherever possible. Remaining residual impacts will then be discussed.
- 8.7.23 In order to test whether or not an impact will affect the integrity of a site or ecosystem and thereby significant, it is necessary to understand whether the changes arising from the Proposed Development are likely to move the baseline conditions at the site or ecosystem closer to, or further from the condition, which constitutes 'integrity' for that system.

### Baseline Conditions

- 8.7.24 The proposed Scoop Hill Community Wind Farm site lies within the Southern Uplands, situated to the south of the town of Moffat, forming a mostly upland block of land between Eskdalemuir and Newton Wamphray, extending south towards Boreland.
- 8.7.25 The upland landscape is characterised by a series of ridges (and some smaller lower ridges) of hills that run broadly from north to south. The hills are higher in the north of the site, where Scaw'd Fell in the west is 549m, and Dun Moss is 541m, in the east. The hills descend to around 250m in the lowest part of the site.
- 8.7.26 There is considerable local relief in some of the valleys between the hills where steep slopes can descend to the watercourses. The main rivers, or burns, are the Wamphray Water, in the west of the site, and the Dryfe Water, in the east.
- 8.7.27 Much of the eastern and central area is covered by dense coniferous plantation (some large areas have been recently felled, and several of those replanted), but most of the western half supports a range of typical open upland habitats and vegetation, used for grazing of both cattle and sheep.
- 8.7.28 A total of 75 turbines is proposed, 34 of which will be positioned on open ground and the remaining 41 will be located within the plantation areas. There are two potential site access entrances. One starts far to the west of the site on the B7076 between Mid Murthat Farm in the north and Cogrie Farm to the south. The track will cross through the former Nether Murthat Quarry and over the River Annan. From there it will continue north-west, across Poldean Farm's pastures, rising until the lower slopes of the westernmost ridge of wind turbines. The second proposed track starts from the minor road to the south of the site, close to the property of Windshields. It follows an existing agricultural track for most of the way until joining the turbine site.
- 8.7.29 The Zone of Influence (ZOI) is identified as the area and resources that may be influenced by the development. It includes a radius around turbines, ancillary structures, borrow pits and access tracks of 500m for the Phase 1 habitat survey, 250m radius for NVC survey and assessment of GWDTEs, and 100m for protected species.

## 8.8 Desk Study

### Natural Heritage Zone

- 8.8.1 Natural Heritage Zones (NHZ) are a system devised by NatureScot. It of comprises sub-divisions of Scotland based on wildlife, natural features, landforms, geology, land use and human impact. The proposed Scoop Hill Wind Farm is within the Western Southern Uplands NHZ and is adjacent to the Border Hills NHZ.

### Designated Sites

- 8.8.2 Part of the Dryfe Water SSSI (also listed in the Ancient Woodland Inventory (AWI) lies near two of the southernmost turbines. The Dryfe Water runs the length of the entire eastern section of the proposed wind farm. Possible impact on the Dryfe Water SSSI will be considered within the impact assessment.
- 8.8.3 As the other designated sites are too distant from the development, they will not be considered further within this EclA.
- 8.8.4 Information was obtained from the AWI regarding the locations of significant woodland areas close to the development. There are a great many small sites, totalling 700, comprising both ancient woodlands and long-established woodlands, within a 20km radius of the proposed wind farm. Some are close to the margins of the 500m turbine buffer zone, or within the developable site. These include the riparian woodlands along the Wamphray Water west of Laverhay and Milne (Milne Wood). At the southern end of the Dundoran Plantation there is Long Wood and Whinny Plantation (Long-Established (of plantation origin)) is close to the proposed site entrance on the Old Carlisle Road. Another un-named woodland lies very close to the eastern access track for the site, on the lower slopes of Rangecastle Hill in the southern part of the site. Several of those woodlands are now conifer plantations. Apart from the woodlands along the Wamphray Water and Dryfe Water corridors, there is no potential for impact on any of the woodland sites. A representative sample of these sites is provided in Appendix 8.6.
- 8.8.5 The Laverhay Forest, Rue Gill Forest and Silton Forest are within the Eskdalemuir Red Squirrel Priority Woodland and are within an area designated as a 'Stronghold Forest' for red squirrel conservation<sup>34</sup>.
- 8.8.6 The majority of the non-statutory sites are not within the same hydrological unit as the development and therefore cannot be directly impacted by any difference in the amount of drainage waters or any extra siltation resulting from it and therefore, they will not be considered further within this EclA.

### Habitat and Species Records

- 8.8.7 Records of protected plants and plants on the LBAP lists and protected species provided through consultation are provided in Appendix 8.7.
- 8.8.8 Blanket bogs, upland heaths, marshes, upland springs and flushes, purple moor grass and rush pastures, acid grasslands, and native ash woods are all Dumfries and Galloway LBAP habitats.
- 8.8.9 The lichens Lungwort *Lobaria pulmonaria*, *Parmeliella triptophylla*, *Sticta fuliginosa*, *S. limbata*, *S. sylvatica* and *Nephroma laevigatum* are known to occur in the Dryfe Water valley. With the exception of *Nephroma laevigatum*, those are priority species in Dumfries and Galloway LBAP. All these species are on the Scottish Biodiversity List (SBL).
- 8.8.10 SWSEIC supplied a record for Juniper *Juniperus communis*, at Outer Mid Hill in the eastern forested area of the wind farm site.

<sup>34</sup> Scottish Squirrel Group.2011. Scottish Strategy for Red Squirrel Conservation

- 8.8.11 Red squirrels are found in the various forests directly adjacent to the site and from the main forested block in the eastern part of the wind farm site, within the Eskdalemuir Red Squirrel Priority Woodlands area. Grey squirrel have been recorded in the Siltan Forest.
- 8.8.12 Otters have been recorded in many of the watercourses in the area including the Dryfe, the Black Esk, Birny Gill and the River Annan.
- 8.8.13 No water voles have been recorded within the development area.
- 8.8.14 Badgers have been recorded at a number of locations within the forests.
- 8.8.15 SWSEIC provided records for Common Pipistrelle *Pipistrellus pipistrellus* and for a pipistrelle roost from the vicinity of the Black Esk, just to the east of the site. A pipistrelle roost has also been known for many years at Finniegill.
- 8.8.16 Red Deer *Cervus elaphus*, Sika Deer *Cervus nippon* and Roe Deer *Capreolus capreolus* have also been recorded in the area.
- 8.8.17 Common Lizard *Zootoca vivipara* and Slow-worm *Anguis fragilis* have been recorded within the site, at Gallatae and near Dryfehead respectively.
- 8.8.18 Common Toad *Bufo bufo* and Common Frog *Rana temporaria* have also been recorded within the site.
- 8.8.19 Desk-top records from SWSEIC show the presence of Atlantic Salmon *Salmo salar*, Brown/Sea Trout *Salmo trutta* and European Eel *Anguilla anguilla* in the Black Esk just to the east of the developable site.
- 8.8.20 SWSEIC provided records of Small Pearl-bordered Fritillary *Boloria selene* and Small Heath Butterfly *Coenonympha pamphylus* which have been recorded in the area.

## 8.9 Phase 1 Habitats and NVC communities (Site Survey)

- 8.9.1 The following habitats were recorded during the Phase 1 Habitat survey. Some are too small to map and are given as Target Notes in Appendix 8.9. Plant species lists are provided in Appendix 8.10. Comments are made below on these small areas of habitat and the main habitats which are described in Sections 8.9.3 to 8.9.52:

- B1.1 Unimproved acid grassland (B Grassland and marsh);
- B1.2 Semi-improved acid grassland (B Grassland and marsh);
- B2.1 Unimproved neutral grassland (B Grassland and marsh);
- B2.2 Semi-improved neutral grassland (B Grassland and marsh);
- B4 Improved grassland (B Grassland and marsh);
- B5 Marsh/marshy grassland (B Grassland and marsh);
- B6 Poor semi-improved grassland (B Grassland and marsh);
- D1.1 Acid dry dwarf shrub heath (D Heathland);
- D2 Wet dwarf shrub heath (D Heathland);
- D5 Dry heath/acid grassland mosaic (D Heathland);
- D6 Wet heath/acid grassland mosaic (D Heathland);
- E1.6.1 Blanket bog (E Mire);
- E1.7 Wet modified bog (E Mire);

- E1.8 Dry modified bog (E Mire);
- E2.1 Acid/neutral flush (E Mire);
- G1 Standing water (G Open water);
- G2 Running water (G Open water);
- A1.1.1 Semi-natural broad-leaved woodland (A Woodland and scrub);
- A1.1.2 Broad-leaved plantation woodland (A Woodland and scrub);
- A1.2.2 Coniferous plantation (A Woodland and scrub);
- A.1.3.2 Mixed plantation (A Woodland and scrub);
- A2.1 Scrub (A Woodland and scrub);
- A4.2 Recently-felled coniferous woodland (A Woodland and scrub);
- C1.1 Continuous bracken (C Tall herb and fern);
- C3.1 Tall ruderal (C Tall herb and fern);
- C3.2 Non-ruderal (Tall herb and fern);
- I1.1.1 Natural acid/neutral inland cliff (I Rock exposure and waste);
- I1.2.1 Natural acid/neutral scree (I Rock exposure and waste);
- I2.1 Quarry (I Rock exposure and waste);
- J1.2 Amenity grassland (J Miscellaneous);
- J4 Bare ground (J Miscellaneous).

- 8.9.2 The main Phase 1 habitats found during the survey are discussed in broad groupings in the following sections and are shown on Figure 8.2 and the target notes on Figures 8.3a to 8.3k.

### Grasslands and related open habitats

- 8.9.3 Much of the study area is comprised of grassland and the most commonly occurring type, by far, is **B1.1 Unimproved acid grassland (B1.1)**. This covers a large proportion of the ground on steeper hillsides and also some hilltop ridges where the soils are shallow, or on well-drained and heavily grazed peats. Acid grassland is the largest of all the open habitat types (including heaths and mires) within the surveyed area, measuring around 892 ha.
- 8.9.4 Much of it is composed of a relatively small pool of species: several grasses, a very limited number of herbs and sedges, and a few mosses. Minor changes in dominants drawn from this pool are used to code different sections of the grassland to NVC community or sub-community level.
- 8.9.5 At higher altitudes, on poorly draining peat soils of varying depth, the grassland is often characterised by the high frequency of Heath Rush *Juncus squarrosus* (NVC U6). Associates include a limited range of common acid grassland species such as Wavy Hair-grass *Deschampsia flexuosa*, Mat-grass *Nardus stricta*, Brown Bent *Agrostis vinealis*, Sweet Vernal-grass *Anthoxanthum odoratum*, Heath Bedstraw *Galium saxatile*, Tormentil *Potentilla erecta* and mosses including *Pleurozium schreberi*, *Rhytidiadelphus squarrosus* and *Polytrichum commune*.
- 8.9.6 Where wetter, usually close to bog vegetation and often in mosaic with it, the vegetation is preferable to the wetter, more acidic NVC U6a sub-community, marked by scattered relic Hare's-tail Cottongrass *Eriophorum vaginatum* tussocks and bog-mosses such as *Sphagnum rubellum* and *S. fallax*.
- 8.9.7 Acid grassland marked by an increase in Mat-grass *Nardus stricta* (NVC U5) is widespread and usually occurs on steeper slopes or shallower ridges, often intimately with the NVC U6 community, or emerging on ridges through degraded blanket mire. However, apart from the change in species prominence, the associated

species complement is very similar to that of the grassier sub-community of NVC U6, and often much of the vegetation is intermediate between the two. Typically, the U6 occurs on higher and level ground, usually more intimately associated with the blanket mire precursor.

- 8.9.8 The steeper lower slopes and steeper burn sides, where the grasslands are less peat-influenced and usually (but not always) better draining, support bent-fescue grassland (NVC U4). Those grasslands share many species of the more acid types but typically have more broad-leaved grasses such as Common Bent *Agrostis capillaris*, Spreading Meadow-grass *Poa humilis* and Sweet Vernal-grass *Anthoxanthum odoratum* along with Heath Bedstraw, Tormentil and Common Sorrel *Rumex acetosa*. Mosses such as (often dense) *Rhytidiadelphus squarrosus* and *Pseudoscleropodium purum* are usually present in addition to more acidophilous species noted above.
- 8.9.9 At some higher elevations and on steep slopes the grassland can be more acidic, with much Wavy Hair-grass and Blaeberry *Vaccinium myrtillus* (NVC U4e). At the lower and more accessible fringes the U4 bent-fescue grasslands are short-grazed and more enriched (NVC U4b) and it can be distinctly improved on the western margins of the survey area (NVC MG6).
- 8.9.10 Unimproved neutral grassland (NVC MG5) appears to be rare although some has been noted along the larger watercourse margins (e.g. Dryfe Water). Additionally, a few poorly-draining pastures have been recorded (NVC MG9 or MG10) with either Tufted Hair-grass *Deschampsia cespitosa* or Yorkshire-fog *Holcus lanatus* respectively predominating. Strips of those types of vegetation also occur in the disturbed margins of forestry access tracks.
- 8.9.11 **Unimproved neutral grassland, B2.1**, accounts for 12.8ha of ground within the study area.
- 8.9.12 A large proportion of acid pasture has been mapped as **B1.2 semi-improved acid grassland**, referable to the NVC U4b sub-community. That category accounts for just under 262ha of the study area.
- 8.9.13 Agriculturally improved kinds of grassland (**B4 Improved grassland, B6 Poor semi-improved grassland and B2.2 Semi-improved neutral grassland**) are well-represented in farmland at the lower elevations of the site.
- 8.9.14 No obvious large-scale calcareous grassland (NVC CG10) was recorded but a few more enriched areas do occur, often where flushed locally along steeper sides of watercourses, or steep hillsides. Indicator species, where drier, include Wild Thyme *Thymus polytrichus*, Dog-violet *Viola riviniana*, Spring Sedge *Carex caryophylla* and Mouse-ear Hawkweed *Hieracium pilosella*. Where conditions are wetter, species such as Glaucous Sedge *Carex flacca*, Quaking-grass *Briza media* and Hairy Oat-grass *Avenula pubescens* are found.
- 8.9.15 Other open communities are limited. Small patches of Greater Woodrush *Luzula sylvatica* were recorded in several places (NVC U16) and there were a few scattered patches with Lemon-scented Fern *Oreopteris limbosperma* (NVC U19), referable to **C3.1 Tall ruderal herb and fern**. There are some stands of Nettle *Urtica dioica* and Creeping Thistle *Cirsium arvense* (NVC OV25) and of Rosebay Willowherb *Chamerion angustifolium* (NVC OV27) around plantation areas, representing the Phase 1 habitat **C3.2 Non-ruderal tall herb and fern**.
- 8.9.16 Those two habitats account for very small amounts of ground within the study area, 0.5ha and 0.04ha, respectively.

### Dry and Wet Dwarf Shrub Heaths

- 8.9.17 Areas of wet and dry acid dwarf shrub heath occur across the site, although they tend only to be significant in the far north, where grazing pressure is lower. **D1.1 Dry acid heath** occupies 302.7ha of the study area and is dominated by Heather *Calluna vulgaris*, usually with subordinate Blaeberry and hypnoid mosses but few other associates at any frequency (NVC H12). A few small areas at higher altitude supported more Blaeberry (NVC H18) and at a few rock outcrops (e.g. Glengap) Bell Heather *Erica cinerea* can be well represented (NVC H10). As noted below, under '**Mire and other wetland vegetation**', the transitions from Heather-dominated dry heath to drier blanket bog is frequently obscure, with a fairly uniform cover of shrubby Heather forming a monotonous canopy and with only subtle changes in associate species (and shallower peat) indicating a change.
- 8.9.18 **D2 Wet heath** (NVC M15) is scattered and usually associated with bog margins, or degraded bog relics, where typical bog indicators (e.g. Hare's-tail Cotton-grass *Eriophorum vaginatum*) are absent. Heather can be frequent, but it is often the presence of species such as Purple Moor-grass *Molinia caerulea* or Deer-grass *Trichophorum germanicum* that indicate wet heath conditions. Associates include elements of bog and drier heath, or acid grassland, vegetation, and peat depth is typically shallow, but retaining some moisture. Purple Moor-grass can dominate some slopes (e.g. in the north-east above the upper stretches of the Dryfe Water, but only locally in the extreme south-west) and can be somewhat intermediate to Purple Moor-grass dominated mire (NVC M25). However, where heath and acid grassland indicators occur, notably Blaeberry and Deer-grass, the NVC M15 code (sometimes NVC M15d) has been applied.
- 8.9.19 **D2 Wet heath** accounts for just over 150ha of the survey area.
- 8.9.20 At some boggy depressions, the wet heath has strong affinities to degraded blanket bog vegetation (NVC M17) and some areas are coded as intermediate where Hare's-tail Cotton-grass is scarce or absent, but bog-mosses are quite well represented, along with species such as Bog Asphodel *Narthecium ossifragum*.
- 8.9.21 At several locations there are areas that have patchworks of dry heath and acid grassland or wet heath with acid grassland and these have been mapped respectively as **D5 Dry dwarf shrub heath/acid grassland mosaic**, or **D6 Wet dwarf shrub heath/acid grassland mosaic**.
- 8.9.22 The D5 and D6 mosaics make up 51.2ha and 32.8ha of the mapped area, respectively.

### Mires and other wetland habitats

- 8.9.23 Bog vegetation is a common feature along most of the higher level summit ridges, although, apart from in the extreme north, much of the bog has been the subject of many years of heavy draining and continuous grazing. That has resulted in a more degraded, grassy (graminoid) bog vegetation cover. At this location, domination by Hare's-tail Cotton-grass is a defining feature of the grazed bogs (NVC M20) and extending down the upper slopes, where there is usually increasing elements of acid grassland, notably grasses and hypnoid mosses.
- 8.9.24 Although the bog vegetation is mostly graminoid, there are usually some ericoids present, such as Heather, Crossed-leaved Heath *Erica tetralix*, Blaeberry and Crowberry *Empetrum nigrum*. Bog-mosses can be well represented, along with hypnoid mosses (notably *Pleurozium schreberi*) and there may be tight tussocks of Haircap Moss *Polytrichum strictum*. In this case, the vegetation is better referred to as the NVC M20b sub-community or even NVC M19 blanket bog. The latter is more distinctive when Heather is more widespread and taller, although still with the cotton-grass, and bog-mosses can be common but often these are limited



- and hypnoid mosses are prevalent (notably *Pleurozium schreberi* and to a lesser extent *Rhytidiadelphus squarrosus*). A feature of higher elevation bogs is the presence of Cowberry *Vaccinium vitis-idaea* and Cloudberry *Rubus chamaemorus*.
- 8.9.25 The Heather-dominated blanket bog, extensively represented in the two northern extensions, can be somewhat monotonous with a low diversity domination by shrubby Heather and limited bog-mosses and hypnoid mosses common, such as *Pleurozium schreberi* and *Hypnum jutlandicum*. This habitat is mapped as **E1.8 Dry modified bog**. The vegetation grades often imperceptibly to dry heath (NVC H12) on shallowing (but still quite deep) dry peat. Separation between NVC M19 and H12 then becomes somewhat arbitrary and extensive areas have been coded with both types (H12-M19 or M19-H12). More typical NVC H12 dry heath usually occurs on the steeper mineral soils below. The best quality bogs can contain several wet hollows and bog pools (**E1.6.1 Blanket bog**). Those features are rather limited at this site but where they occur, they contain some vegetation referable to the wet raised mire NVC M18 with *Sphagnum magellanicum*, and extensive *Sphagnum* lawns (mostly *Sphagnum fallax*, but also *S. cuspidatum* and *S. papillosum*) usually accompanied by cotton-grasses (*Eriophorum spp*), referable to NVC M2.
- 8.9.26 There are several lower altitude bogs, mainly in the south, occurring on level ground usually around watercourse margins or headwaters, such as at the Sembletree Burn that feeds The Caple, notably at Cadwell Moss. There are further relics of this habitat at Peat Hill and Loftshaws, and in the plantation glades along the Murthat and Cocklaw Burns. These bogs share core bog elements noted above but usually with species such as Deer-grass and Bog Asphodel and the bog-moss cover is usually more extensive, often with much *Sphagnum fallax*, *S. papillosum* and *Aulacomium palustre* can be locally frequent and there can be other bog-mosses and some liverworts. These bogs are best classified as NVC M17 blanket bog, although a few wetter hollows are closer to the raised bog community, NVC M18. Where the bogs are heavily-drained (which occurs at many areas), the vegetation is more modified (NVC M17c) and some of those grade into, or are intermediate with, wet heath on shallowing peat (NVC M15).
- 8.9.27 **E1.6.1 Blanket bog** occupies roughly 89.5ha of the survey area.
- 8.9.28 In **E1.7 Wet modified bog**, Hare’s-tail Cotton-grass can be frequent but Purple Moor-grass *Molinia caerulea* generally forms a significant proportion of the vegetation (NVC M25). This is a common habitat around blanket bog margins, where it occurs on deep peats and with other bog species as associates. Such areas are well represented (often along ride margins) on deep peats in the plantation zone and can show up quite distinctly as pale patches and strips on aerial images. The Purple Moor-grass vegetation is often rather monotonous and tussocky but, rarely, where there is some mineral flushing on shallower peat, associate species diversity can be higher (NVC M25c – see below **B5 Marshy grassland**).
- 8.9.29 **E1.7 Wet modified bog** accounts for around 31.7ha of the area surveyed. **E1.8 Dry modified bog** accounts for a much larger area, roughly 312.6ha.
- 8.9.30 Other mire vegetation is widespread and often forms extensive stands along broad valleys and to the margins of watercourses, and many are fed by drainage (both natural and artificial) from the blanket mires along the summit ridges. Where associated with bogs, as in shallow erosion gullies or broader drains, there can be luxurious *Sphagnum* ‘lawn’ vegetation, with thick mats of bog-moss (mostly *S. fallax* but also *S. cuspidatum* and *S. papillosum*) usually with cotton-grasses *Eriophorum spp*. (NVC M2). This type of vegetation often grades, with increasing water movement (**E2.1 Acid/neutral flush**), to sedge mire (NVC M6) where Common Sedge and Star Sedge *Carex echinata* occur. Very often these mires are dominated by Soft Rush *Juncus effusus* (NVC M6c) or Sharp-flowered Rush *Juncus acutiflorus* (NVC M6d). All share *S. fallax* as extensive ground cover. The rush-dominated types of vegetation usually swiftly grade to more mineral-enriched rush-pastures (NVC M23) as noted below.
- 8.9.31 In most cases the more distinctly minerotrophic flushes or marshes are dominated by rushes (Soft Rush or Sharp-flowered Rush) and are widespread along the lower hillsides and along watercourse margins. The largest zones, usually flushed, are dominated by Sharp-flowered Rush and associates typically include Marsh Thistle, Marsh Bedstraw *Galium palustre*, Meadow Buttercup *Ranunculus acris*, Marsh Violet *Viola palustris*, Cuckooflower *Cardamine pratensis*, grasses such as Yorkshire-fog and Tufted Hair-grass and, typically, the moss *Calliergonella cuspidata*. Soft Rush mire (NVC M23b) is also widespread as it is more often associated with drains and watercourse feeders, often where the water is more stagnant. Small patches of soft Rush are a frequent feature of poorly draining hillsides and ridges otherwise dominated by short-grazed acid grassland, although here they are typically relatively dry and lack a number of typical marsh elements.
- 8.9.32 There are several areas where the species diversity of rush pastures can be quite high, presumably reflecting reduced grazing pressure but also more base-rich flushing: indicators can include Bugle *Ajuga reptans*, Yellow Pimpernel *Lysimachia nemorum*, Opposite-leaved Golden-saxifrage *Chrysosplenium oppositifolium*, Devil’s-bit Scabious *Succisa pratensis*, Marsh Hawk’s-beard *Crepis paludosa*, and more locally, Marsh Valerian *Valeriana dioica*, Smooth-stalked Sedge *Carex laevigata*, and rarely, Slender Sedge *Carex lasiocarpa*. The latter occurs at mires along small watercourses in the plantation zone. Also, here, due to the lack of grazing, Meadowsweet *Filipendula ulmaria* can become dominant as opposed to Sharp-flowered Rush (NVC M27), but species diversity is usually similar.
- 8.9.33 The rush-pastures are mapped as **B5 Marshy grassland**.
- 8.9.34 Other small mires, flushes and springs occur, scattered across the site, usually with short sedges and mosses (NVC M6 and, rarely, NVC M10). There are also a few very small flushes with much *Palustriella commutata* (NVC M37). The latter were recorded on the lower slopes of Loft Hill and Peat Hill, above the Dryfe Water, and on the western slopes of Heatherybrae Head, Howgill Fell and Criffel. The NVC M37 springs, referable to **E2.3 Bryophyte-dominated spring**, are too small to map and their locations are noted by target notes.
- 8.9.35 Only a small area of these wetlands, 0.5ha, has been mapped as **E2.1 Acid/neutral flush** habitat in the survey area. Areas mapped as **B5 Marshy grassland** occupy a much larger 39ha.
- 8.9.36 **F1 Swamp** is rare in the study area and accounts for only 0.2ha of the mapped area. Only small patches were found, sometimes associated with ponds, in the lower-lying agricultural areas such as near the start of the proposed western access track near Cogie. That swamp is typical of NVC S9a *Carex rostrata* swamp, dominated by Bottle Sedge *Carex rostrata*. The drier margins have patchy Reed Canary-grass *Phalaris arundinacea* and rush mire (NVC S28 and NVC 23).
- 8.9.37 The large Black Esk Reservoir lies around 500m to the east of the site and is hydrologically unconnected. However, within the construction site **G1 Standing water** is scarce and is generally man-made, such as farmland ponds. There is a small pond beside the existing forestry access track in the Silton Forest that is likely to have been excavated as a duck-shooting pond. A much larger waterbody is the lagoon in an area that is proposed to contain part of the far western access track into the site. It is situated beside the River Annan and is a relic of the former Nether Murthat sand and gravel quarry. **G1 Standing water** accounts for 0.65ha of the study area.



- 8.9.38 The River Annan is by far the largest watercourse within the study area. The river is a significant habitat for wildlife including brown and sea trout, Atlantic salmon, brook lamprey, European eel, otter, kingfisher, and osprey.
- 8.9.39 The part of the site containing the turbines is drained most obviously by a few smaller rivers and their various feeder burns. In the north-west of the site, the high ridges drain to the Glengap Burn and the Wamphray Water. The Glengap Head/Craig Fell ridge drains to the west through Hodge Burn and Washy Burn. These have several small feeders, including networks of interconnecting feeders in the Laverhay Forest on the east side of the Wamphray. The largest watercourse in the eastern part of the site is the Dryfe Water. There are a few other long watercourses that are its main tributaries: Cocklaw Burn, The Caple and the Waterhead Burn. These small rivers and burns represent the habitat **G2 Running water**.

#### Woodland, Scrub and Bracken

- 8.9.40 Conifer plantations (**A1.2.2 Coniferous plantation**) cover large areas of the survey area, some undergoing current felling operations and many recently replanted. Several of the latter areas have been mapped as **A4.2 Recently felled conifer woodland**, diverging from normal Phase 1 methodology in order to give a clearer impression of the current state of the habitats. It is known that those areas are intended to be replanted. The plantations have not been surveyed in any detail as with dense planting there is little or no semi-natural vegetation persisting, except along a few rides, watercourses and track margins (but here scarcely any woodland and only patchy scrub). There has been some native broadleaved woodland planting about larger watercourses in the south of the plantation zone (A1.1.2), and some mixed plantation (A1.3.2) was mapped on ground that was included in a previous iteration of the wind farm design.
- 8.9.41 **A1.2.2 Coniferous plantation** accounts for 2,374ha within the survey area. **A 4.2 Recently felled coniferous woodland** accounts for 706.1ha.
- 8.9.42 Mature broadleaved woodland (**A1.1.1 Semi-natural broadleaved woodland**) occurs along the lower stretches of the Dryfe Water, The Caple and the Cocklaw Burn in the far south but it is poorly represented or absent at higher elevations in the rest of the survey area. The only exception is some scrubby woodland associated with the Glengap Burn in the north-west. These woodlands are associated with watercourses and tend to be of the valley Ash *Fraxinus excelsior* woodland type (NVC W9), indicating some mineral enrichment. Their upper slopes grade from acid grassland or bracken and have affinities to more acidic Oak woodland *Quercus* sp (NVC W11).
- 8.9.43 **A1.1.1 Semi-natural broadleaved woodland** occupies 42.6ha of the mapped area.
- 8.9.44 There has been some native woodland planting about larger watercourses in the south of the plantation zone (**A1.1.2 Broadleaved plantation woodland**), and some **A1.3.2 Mixed plantation** was mapped on ground that was included in a previous iteration of the wind farm design. Those habitat types occupy 75.4 ha and 15.8 ha respectively.
- 8.9.45 **A2.1 Scrub** occurs at the woodland areas noted above (often predominantly), where it tends to be of the thorn type (NVC W21). There are some areas with patches of willow scrub. Several patches are typical of wet carr woodland (NVC W1) with Grey Willow *Salix cinerea* dominant and much Marsh Bedstraw *Galium palustre* and Soft Rush. Others, particularly where the soil is a little acid, have much Eared Willow *Salix aurita*, or Goat Willow *Salix caprea*. Those are coded in the habitat map as 'WSx'.
- 8.9.46 **A2.1 Scrub** occupies only 16ha of the survey area.

- 8.9.47 Bracken stands *Pteridium aquilinum* occurs sporadically throughout, mostly on steeper ridges or valley sides, but is extensive in the north-west around Glengap Burn and on the western fringes at Gallatae, where grazing is presumably limited. Most of the bracken vegetation appears to be derived from acid grassland pasture (NVC U20) with no obvious woodland type (NVC W25) although this may occur locally about the steeper watercourse slopes in the plantation zone where access is difficult.

- 8.9.48 **C1.1 Continuous bracken** makes up around 130ha of the study area.

#### Natural rock exposures and waste

- 8.9.49 Two small sections of naturally occurring inland cliff (**I1.1.1 Inland cliff**) are found at Glengap Craig in the western part of the site. It was not possible to sample the cliff vegetation closely. The habitat accounts for a very small 0.05ha.
- 8.9.50 There are some open scree areas (I1.2.1), notably above Gallatae and around Glengap Burn in the north-west of the site. They are often hidden by tall Bracken and Heather stands. Mosses, lichens and ferns are prominent there (NVC U21) however Parsley Fern *Cryptogramma crispa*, usually integral to this community, is present in very low amounts.
- 8.9.51 There is a very small 2.2 ha of scree in the survey area.

#### Miscellaneous Habitats

- 8.9.52 Small areas of **J4 Bare ground** occur (2.1ha), scattered throughout the site. These small patches are where soil has been exposed on agricultural ground by working vehicles or animals, or where there is bare, stony ground left after previous quarrying. Bare ground occupies a small 5.7ha of the study area. A small area of **J1.2 Amenity grassland** is to be found at the Dryfehead Bothy, measuring 0.05 ha. Patches of **J1.3 Ephemeral/short perennial** vegetation (0.5ha) occur in the farmland and former quarry areas in the western part of the study area.

#### Notable plant species

- 8.9.53 Since much of the area is dominated by bog vegetation and long-grazed acid grassland, both somewhat uniform, the core vascular species diversity is fairly limited. However, a few flushes, rock exposures or screes (often around watercourses), add to the overall species diversity.
- 8.9.54 The upland blanket bog elements such as Cloudberry and Cowberry seem to be limited in scale, and the easily overlooked Lesser Twayblade *Neottia cordata* was only noted on a couple of occasions but may well be more widespread.
- 8.9.55 Where the ground is free-draining, and the habitat more heath-like, species of interest included a few records for Common Cow-wheat *Melampyrum pratense*, Stag's-horn Clubmoss *Lycopodium clavatum* and Parsley Fern. Heath Pearlwort *Sagina subulata* was notable, confined to forest track gravels, such as at Dundoran Plantation. There was one record for Starry Saxifrage *Saxifraga stellaris*, but this occurs by a small stream adjacent to the track in the higher reaches of the Dryfe Water.
- 8.9.56 At lower elevations there are a few flushes of interest and some areas of less acidic grassland that encourage more diversity. Species of local interest there, usually sparingly, include Fen Bedstraw *Galium uliginosum*, Tawny Sedge *Carex hostiana*, Hairy Oat-grass *Avenula pubescens*, Smooth-stalked Sedge *Carex laevigata*,

Melancholy Thistle *Cirsium helenoides*, Scurvy-grass *Cochlearia officinalis*, Lesser Pond-sedge *Carex acutiformis*, Stone Bramble *Rubus saxatilis* and Burnet-saxifrage *Pimpinella saxifraga*.

- 8.9.57 Bryophytes were recorded, though not sampled in any detail, and only a provisional species list is provided. As with the vascular plants, the bryophytes are typical of acid grassland and bog habitats. A good range of bog-mosses was noted, however, including *Sphagnum teres* and *S. russowii* and there was some *Leucobryum glaucum*. Further diversity is associated with usually small flushes where *Palustriella commutata* could be abundant.
- 8.9.58 Lichens were seldom noted, other than in bogs or heaths with shrubby *Cladonia* species. The limited local rock outcrops and scree might reward more detailed sampling.

## 8.10 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

- 8.10.1 The NVC communities identified over the course of the surveys have been assessed against criteria provided in SEPA guidance relating to groundwater dependency, which is set out in Table 8.9. Further information regarding the groundwater dependency is detailed in the following paragraphs. Figure 8.4 shows the wind farm infrastructure overlying the NVC communities within a buffer defined by 100m from access tracks of cut typologies and 250m around deeper excavations.

**Table 8.9 – Groundwater Dependency Scores**

Score	Description
1	Denotes 'Strong dependency on groundwater discharge from bedrock or superficial aquifers at a majority of sites'.
2	Denotes 'Likely to be some dependency on groundwater discharge at a majority of sites – either direct from recognised aquifers or indirectly as recharge from minor aquifers in superficial deposits. Water from other sources (surface run off, overbank flooding etc) may also be very important'.
3	Denotes 'Groundwater discharge usually irrelevant. Site fed by other water sources. This may include components of ombrogenous systems with intrinsic groundwater system fed by rain.'

- 8.10.2 In relation to the above Table 8.9, U6 *Juncus squarrosus-Festuca ovina* grassland, M15 *Trichophorum cespitosus-Erica tetralix* wet heath, and M25 *Molinia caerulea-Potentilla erecta* mire, M27 *Filipendula ulmaria-Angelica sylvestris* mire, MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, MG10 *Holcus lanatus-Juncus effusus* rush-pasture and W1 *Salix cinerea-Galium palustre* woodland, have a groundwater dependency score of 2, considered likely to be moderately groundwater dependent.
- 8.10.3 Many intermediate communities were identified, such as 'M15-U5', 'MG10-U4'. In the great majority of cases, the intermediate vegetation has been assessed as having low groundwater dependency.
- 8.10.4 M4 *Carex rostra-Sphagnum fallax* mire (in intermediate communities 'M4-M6' and 'M6-M4'), M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M10 *Carex dioica-Pinguicula vulgaris* mire, M23 *Juncus effusus/acuteiflorus-Galium palustre* rush-pasture, M37 *Palustriella commutata-Festuca rubra* spring, U16 *Luzula sylvatica-Vaccinium myrtillus* tall herb community and W7 *Alnus glutinosa-Fraxinus excelsior-*

*Lysimachia nemorum* woodland are thought to be highly groundwater dependant and have the groundwater dependency score of 1.

- 8.10.5 Intermediate communities between highly communities, identified by SEPA as possibly being highly groundwater-dependent, such as 'M23-M6' and 'M4-M6'. Those would be assessed as possibly having high groundwater dependency.
- 8.10.6 GWDTE communities have been identified using the plant communities described in the SEPA guidance for identifying GWDTEs<sup>35</sup> but also taking into account underlying geology and hydrology.
- 8.10.7 Out of both categories of groundwater dependency, the following communities can be removed from the discussion: W1 woodland, W7 woodland and M37 mire. The woodland communities lie well outside the zone of influence, being found in the riparian woodlands along the main watercourses. The M37 mire communities are extremely small. The locations on lower slopes are indicated by target notes. Three springs are found on the slopes of Howgill Fell, Heatherybrae Head and Criffel. Two of those lie well outside the 250m buffer around the turbine excavations. The other one lies just on the edge of the buffer and is unlikely to be impacted by the development.
- 8.10.8 Also removed from further discussion are NVC U6 grassland and M15 wet heath. U6 grassland on the site is strongly associated with blanket mire communities (mainly M19 and M20) on plateaux or shallow slopes. It is taken to represent a secondary type of vegetation derived from those blanket mires over a long period of heavy grazing pressure, and therefore to be an ombrogenous community.
- 8.10.9 The NVC M15a *Carex panicea* sub-community is the *soliginous* sub-community that justifies the inclusion of NVC M15 in the SEPA guidance. This community is not present within the survey areas. The other sub-communities present, the typical sub-community and (mainly) the grassy M15d, are considered to represent mire vegetation on thin peat. They are also dismissed following the discussion in the following paragraphs.
- 8.10.10 The remaining communities require to be examined from the perspective of their groundwater dependent status in relation to the specific conditions and locations at the site of the proposed wind farm. Three main rock formations underlie the main turbine area of the site. Those are the Glendearg Formation in the north, the Carghidown Formation (Metasandstone and Metamudstone) below that across the central area and extending to the south west, and the Hawick Group (Wacke) in south eastern part comprising the Silton Forest area. Younger rock formed in the Permian Period overlies those older Silurian rocks in the extreme west of the site, at Dundoran Plantation. That is the Hartfield Formation (Sandstone, Pebbly Sandstone and Angular Pebble-Grade Conglomerate).
- 8.10.11 The older Silurian formations have the same characteristics. They are all low productivity aquifers, with flow taking place vertically through fractures and other discontinuities. There is only limited groundwater in the near surface weathered zone and secondary fractures. Those rock formations underlie the main wind farm 'turbine' area.

<sup>35</sup> SEPA.2017 LUPS Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems

- 8.10.12 The younger Hartfield Formation is classed as a high productivity aquifer with both intergranular and fracture flow. The younger rocks underlie much of the area that is proposed to contain a long access track that begins to the west of the M74 motorway.
- 8.10.13 On that basis the remaining community that was considered in the SEPA guidance as moderately dependent on groundwater, M25 mire has to be considered to have low groundwater dependency at the site. This is supported by its consistent association in vegetation transitions between ombrogenous communities, such as M20 mire, or in its association with M15 wet heath communities on thinning peat. Only the GWDTEs that are given as ‘highly dependent’ in the SEPA guidance are now discussed further. These are: intermediate mires (variously intermediates between M4 and M6, M23 and M6, or in some cases intermediate communities with grassland types), M6c mire, M6d mire, M10 mire and M23a and M23b rush-pasture.
- 8.10.14 Several examples of M6c and M6d mire and a small number of intermediate stands that include M4 mire occur in a linear network of natural surface depressions (and also within man-made drains or ‘grips’) within or at the edge of sections of ombrogenous mire. In those situations, those examples are considered also to be dependent on rainfall, and so have a low groundwater dependency there.
- 8.10.15 On lower slopes there are several examples of M6c and M6d mire, M23a and M23b rush-pasture and many intermediate stands. There is also one example of M10 mire and a small number of M37 springs (too small to map). In those situations, M6c and M6d mire are likely to have low groundwater-dependency at most locations. M23a, M23b, M10 and M37 may be considered to be at least moderately groundwater-dependent at some locations, where they support a distinctive range of associate herbs due to the presence of either circum-neutral or base-rich irrigating water.
- 8.10.16 The GWDTE sensitivity of all habitats is summarised in Appendix 8.18.

## 8.11 Species (Site Survey)

### Bats

- 8.11.1 The Proposed Development is situated on open moorland habitats and adjacent to conifer plantations. According to the Bat Conservation Trust Guidelines (2013), those habitats are judged to be of low value to bats.

### Roost Survey Results

- 8.11.2 There are several farms and other buildings within the developable construction site that is shown on the map by the red line site boundary, but none of those is within the zone of influence defined for bats. It is very likely that there will be bat roosts at some of those properties, such as the farm Leithenhall. Bat activity (pipistrelles) was found to be high in this general area. There are only a small number of buildings within the site boundary: a shed at Dunscore Hill beside the existing forestry access track, the Dryfehead Bothy and two dwelling houses in the Finniegill area. All the properties are surrounded by coniferous plantation. The shed at Dunscore Hill was assessed as having low roost potential as it has a type of construction with multiple vents in its upper half and an opening that has been installed to allow access by owls. The bothy at Dryfehead had already undergone much recent restoration work at the start of the survey period in 2017, with evident repairs to the roof and re-pointing work done. That work continued into 2018. The bothy was examined and assessed as having no potential roost features (PRFs). There is a roost in the older, original property at Finniegill, along the course of the Dryfe Water, and surrounded by coniferous plantation.

- 8.11.3 The extent to which bats associate with non-native commercial conifer plantations is relatively unexplored, however recent findings have shown that they may be an important habitat for *Pipistrellus* species mainly *Pipistrellus pygmaeus*.<sup>36</sup> Bats have been found to roost in conifers if they are mature and have suitable holes and cracks and upland conifer plantations can provide suitable foraging and commuting habitats<sup>37</sup>.
- 8.11.4 At the time of writing, much of the eastern plantation (Silton Forest, Rue Gill and Dryfehead areas) has a very low cover of felling age trees and harvesting is underway in the Laverhay Forest.
- 8.11.5 Mature broadleaved trees are very localised within the developable site, mainly confined to the riparian woodlands along the Wamphray Water and in the Dryfe Water SSSI. Otherwise there are only isolated scattered trees, such as two large mature Sycamore trees beside the Dryfehead Bothy and some older trees along field boundaries in the southern part of the site, all with limited PRFs. These were not surveyed for roosts as they are unaffected by the development.
- 8.11.6 There are no old stone bridges over the watercourses in the site. Culverts, that support few potential roost features (PRFs), have been used for the crossings.
- 8.11.7 One bat roost survey was undertaken at Finniegill where the resident of the older property had indicated the presence of a natal roost. An emergence/re-entry survey undertaken on 9<sup>th</sup> and 10<sup>th</sup> September 2019 recorded 20 Bats emerging/re-entering the roost. 17 of the 20 bats used three main parts of the main dwelling house. Three bats were observed re-entering the shed adjacent to the house on its east side. It is quite likely that the late date of the roost survey missed a higher earlier number of bats, since by then some bats may have dispersed to other roosts. Both Soprano and Common Pipistrelle bats were recorded by the bat detectors. It is not possible to say clearly if one particular species is roosting there, or whether small numbers of both species are roosting in separate small roosts in different parts of the building.

### Remote Bat Detector Results

- 8.11.8 Static remote detectors presented an often highly variable picture of bat activity around the site. High numbers of passes were recorded on lower ground beside linear features such as watercourses or woodland edge. In early June 2018 over 4000 pipistrelle passes were recorded over a 7-day period at Sembletree Burn. During the same period, and within the same survey area, over 1000 pipistrelle passes were recorded along a strip of broadleaved trees left at the edge of a felled plantation north of Winshields Hill. In the same recording area, at Gudewife’s Hill, from a bat recorder placed in unpromising habitat on a snag remaining in clear-fell, there were no bat passes.
- 8.11.9 The same preponderance of pipistrelle species was found in the results from the static detectors as has been noted from the bat activity transect results. There were similarly small numbers of *Myotis* species, Noctule and, additionally, Brown Long-eared Bat *Plecotus auritus*.

<sup>36</sup> Kirkpatrick, L. (2016) Bat exploitation of Sitka Spruce Plantations: Impacts of management on bats and nocturnal invertebrates. University of Stirling.

<sup>37</sup> Woodland management in the presence of bat species. Guidance for compliance with the Habitat Regulations. [www.bats.org.uk/.../Woodland\\_management\\_in\\_the\\_presence\\_of\\_bat\\_species\\_Wales](http://www.bats.org.uk/.../Woodland_management_in_the_presence_of_bat_species_Wales)

- 8.11.10 Following a temporary change in the design of the wind farm, the Dundoran detectors were placed out only on one occasion, early in the season, at the end of May 2018. The results of the single placement were varied considerably. The recordings from the detector on Broadfield Height contained the greatest number of passes, with a little over 300 pipistrelle passes over a period of 5 days. The detector was placed on a stone wall that runs from the valley bottom of the Glengap Burn and continues roughly north to the eastern slopes of Gallatae and Craig Fell. The wall likely provides a suitable linear feature for bats that forage along the Wamphray Water and Glengap Burn valley. Two other detectors were placed on the west side of the Broadfield Height/Windshield Hill ridge. The detector at the edge of a ride in the Dundoran Plantation detected much less records over the recording period (45 pipistrelle passes and 6 *Myotis* bats) and the detector near Burnt Mound, placed alongside a defunct wall, recorded no passes. The detector at the highest elevation, on Craig Fell, recorded a smaller number of pipistrelles than found at Broadfield (a little over 600), and a small number of Noctule passes (7).
- 8.11.11 The Gillesbie detectors recorded a large number of bat passes at specific points, as already mentioned above. The very high number of bat passes at the Sembletree Burn (by far the highest number recorded during the remote detector survey) confirms the known high value of watercourses for bats generally and it is certain that the Dryfe Water (to which Sembletree Burn and The Caple are connected) and its feeder burns is a significant corridor network for bats within the study area. Much smaller numbers of passes were recorded at other locations, Gudewife's Hill and Gillesbie Hill, though with unusual variations. At both locations, during separate recording periods, no bat passes were recorded.
- 8.11.12 The Ruegill Hill/Ramshaw Rig area detectors recorded very few passes, generally, with one exceptional peak of activity on Ruegill Hill/Peat Rig. At that location, where the detector was placed on a young spruce tree at the end of an overgrown access track, just under 220 pipistrelle passes were recorded. The track provides a suitable linear feature for pipistrelle species. After many years of little use, much of the track length has been colonised by low-growing willow bushes and immature spruce trees. Noctule was recorded only by the Ramshaw Rig detector that was placed on a dead snag within an area of clear-fell/replant. Small numbers of *Myotis* bat passes were also recorded there and additionally by the Dryfehead valley recorder (placed at the edge of the track leading to the upper valley). Supplementary data from AudioMoth detectors in early May 2019 from three locations along the Dryfe Water included a small number of pipistrelle passes (17 common pipistrelle, 1 soprano pipistrelle over a period of 11 days) at the location near the Dryfehead Bothy.
- 8.11.13 The Siltan Forest area detectors gave a very small number of results from their first deployment in mid-May 2018 when only two pipistrelle passes were recorded at the small open area of relic blanket bog below the north-eastern slopes of Macmaw Hill. Thereafter the number of bat passes increased, giving a peak in July over a period from 10/07/18 to 16/07/18. Pipistrelle passes were by far the greatest number, with around 530 passes. Just under 90 passes of *Myotis* bats were recorded. Also, there were small numbers of Noctule (9) and Brown Long-eared bat passes. In general, the highest numbers of passes were recorded by the detector placed near the large foresters' shed beside the track (where there is a clearing planted with young broadleaved trees), though the highest number of Noctule passes was recorded by the detector at Little Brown Knowe. The number of passes recorded at the location on the western slopes of Macmaw Hill remained notably low throughout the whole period of remote survey. That part of the site also was found to have little or no bat activity during the transect surveys.
- 8.11.14 The South Loch Fell/Dun Moss recorders found rather small numbers of pipistrelle, Noctule and *Myotis* species. Both recording periods from the detector fixed at a strainer post in open ground at Dun Moss, the further north of the two detector locations, had single figure numbers for pipistrelle species and Noctule. Noctule was not recorded at the southern of the two locations, where there were both Common and Soprano Pipistrelle and one *Myotis* bat, the latter only during the second recording period. Peak pipistrelle pass numbers at the southern of the two locations, on South Loch Fell, were 89 Common Pipistrelle and 17 Soprano Pipistrelle.
- 8.11.15 The Three Mullach Hill detectors recorded a high number of pipistrelle passes. Numbers were higher by far at the location at the track edge on the east side of the hill, closest to the roost location, and beside an open ride leading to the valley bottom. Pipistrelle passes numbered 775 over a recording period of 5 days. Soprano Pipistrelles accounted for 303 passes, 50kHz pipistrelles (not assignable to either Common or Soprano Pipistrelle) numbered 25, and there were 447 Common Pipistrelle passes. Fewer numbers of passes were detected at the other two locations, both of those situated in the open clear-fell/replant areas that will contain the turbines. Numbers were rather high at the southern of the two locations where there were just over 230 pipistrelle passes. Small numbers of Noctule passes (2, 3 and 4) were recorded at each location and there were similarly low numbers for *Myotis* bats and Brown Long-eared bats, both genera confined to a single location.
- 8.11.16 Appendix 8.12 summarises the number of bat passes recorded each month (by remote detectors). Numbers of bat passes can be seen to vary a great deal, likely depending on location, habitat, weather conditions, height above sea level and time over the season. However, some variations are hard to explain, with apparently poor and unpromising locations (open clear-fell) recording on specific occasions similar results to more promising linear habitats (track edge with scrubby trees). These oddly skewed results have been observed in data from other wind farm surveys as well.
- 8.11.17 The highest number of 5,438 passes was recorded beside the Sembletree Burn at approximately 270m.
- 8.11.18 It is likely that this large number indicates the value of the watercourse corridors in that particular part of the site for bats: the sheltered course of the Sembletree Burn feeds The Caple that joins the larger Dryfe Water, the latter two having large extents of marginal broadleaved woodland and scrub.
- 8.11.19 Other peaks of activity were noted beside the shed in Siltan Forest (July 2018) at the shed location beside the track at the edge of coniferous plantation and beside semi-improved pasture along a strip of broadleaved trees and scrub at the edge of the harvested plantation.
- 8.11.20 Bats were also recorded in other areas outside the survey time as surveyors left the site including Leithenhall, Kirk Brae, Milne Wood and Shankend.
- Bat Activity Survey Results
- 8.11.21 Full results from all the activity surveys are provided in Appendix 8.11, and the results from the remote detectors in Appendix 8.12.
- 8.11.22 During all transect surveys the overwhelming majority of the bat records were of either Common *Pipistrelle Pipistrellus* or Soprano Pipistrelle *Pipistrellus pygmaeus*. There were a small number of records of *Myotis* species and Noctule *Nyctalis noctula*. The great majority of records from transects were of bats flying along the edges of conifer plantations or other linear features within the site, where the bats were feeding and commuting and were often seen by the surveyors. There were very few bat passes recorded over the open and/or higher ground.
- 8.11.23 Seasonal peaks were noted in the months of July and August 2018.

- 8.11.24 The Dundoran transect in early May gave only a small number of results from within the zone of influence for bats. No bats were detected in the Dundoran Plantation or on the open ground from the north of Dundoran to Burnt Mound and until the lower slopes of Broadfield Height. On Turf Hill, Windshield Hill and Leithenhall Rig there was a *Myotis* bat pass and a small number of pipistrelle passes were recorded. Once at the southern side of the Leithenhall Rig shelterbelt at the edge of the developable site, there were several pipistrelle passes and one of a *Myotis* bat in the lee of the wood (wind NE). After the end of first transect, the recorder was kept running and there were several more pipistrelle records along the field boundary on the way to the farm. Finally, at Leithenhall Farm, while the surveyors were in conversation with the tenant farmer at the edge of the farmyard, there was considerable pipistrelle activity being recorded by the detector, and also at the woodland along the Leithenhall Burn, south of the farm.
- 8.11.25 The Laverhay transects recorded very few bats at the start, while walking up through the low-lying pastures of Laverhay Farm. The one notable exception was a small number of Noctule passes at the shelterbelt and along the track below Alkie Knowe, on one occasion. Few passes were recorded over the long stretch from the edge of the improved pasture, through acid grassland and onto the Milne Height ridge blanket bog, until approaching the edge of Laverhay Forest on Laverhay Height. Records over that part of the transect were all of pipistrelles. By far the largest numbers of passes were along the edge of the Laverhay Forest while descending from Laverhay Height to the track and sheepfold. All bat passes there were either of Soprano or Common Pipistrelle. Activity was very low at the start of the survey in mid-May, and on the last visit, in mid-October, no bat passes were recorded.
- 8.11.26 The Gilliesbie transect gave relatively few results. Surveyors used agricultural tracks for part of the survey and crossed habitats that had been improved somewhat for the grazing of cattle and sheep, though retaining some small scattered patches of blanket bog or unimproved acid grassland. The results were almost all of pipistrelles, scattered randomly throughout the area, along the agricultural track or on some of the highest ground, e.g. Loft Shaws (326m). There were two records of a *Myotis* bat, one close to The Caple (tributary of Dryfe Water) and the other on open ground at Loft Shaws. The earliest visit in May recorded only two pipistrelles at the very edge of the site and outside the transect at the B road near Shankend. The last visit in October recorded only three pipistrelle passes. The intervening transects had scarcely more numbers of passes, with four passes of soprano pipistrelle recorded at one listening point in June.
- 8.11.27 The Three Mullach Hill transect gave few results from the first three visits in the season. Transects undertaken in mid-May and early and mid-June returned very low numbers of bat passes, all of pipistrelle bats. Two months later in August there was a much larger number of passes recorded. That may reflect a sudden increase in a particular food supply at that time or/and an increase in the number of bats from a potential maternity roost at Finniegill.
- 8.11.28 The Silton Forest transect gave many records of pipistrelle bats and occasional Noctule and *Myotis* bat. Two clusters of activity were noted. The larger cluster was in the southern part of the transect, from Macmaw Hill to Andrew's Rig, where large rides run up the slopes from the Dryfe Water, with smaller feeder burns and seepages running through mainly semi-natural vegetation (with a little recent broadleaved plantation locally). It is likely that those rides provide a productive edge for bats to follow up from the Dryfe Water. Bats were frequently seen near the start of the transect flying along just above the top of the treeline. The much smaller cluster was in the vicinity of Crush Gutter, where the forestry access tracks run across the Dryfe Water by way of various culverts. Long stretches of track to the west of Dod Hill and on the north west slopes of Macmaw Hill had few records or none. The smaller cluster possibly reflects increased activity associated with the Finniegill roost. The larger cluster suggests a possible roost further south in the Dryfe Water valley.

- 8.11.29 The Rue Gill Hill transect gave very few results. A small number of bat passes (mostly pipistrelles with one *Myotis* bat) was recorded on low ground below the turbine ridges, along the watercourse at Duncan's Cleuch and along the scrub-edged track from there down to the bothy at Dryfehead. There was only one record from the higher ground on the transect, a pass by a Common Pipistrelle from along the overgrown track out to the grouse butts on Peat Rig.

#### Otters

- 8.11.30 Otter evidence is summarised within Appendix 8.14 and shown on Figure 8.7. Sensitive information on holts and lie-ups are contained within the separate Confidential Annex. Otter activity was recorded on many of the watercourses including the Dryfe Water and its tributaries. It is highly likely that most watercourses and bodies within the ZOI are used by a small population of otters at certain times of year especially in spring when otters are likely to use the watercourses to access moorland pools, when frogs are active.

#### Water Vole

- 8.11.31 Despite the habitat appearing to be possibly suitable in some areas of the site, no evidence of Water Voles was found. Generally, the watercourses were generally too fast-flowing and rocky to be suitable.

#### Badgers

- 8.11.32 Badger activity was found commonly throughout the site, with active setts recorded to nearly six hundred metres in altitude at the north of the site. There was a lot of badger activity in some locations where no badger sett was located, suggesting some setts will have been overlooked. Several setts were recorded on open moorland and hill pasture with those habitats also providing rich foraging. Non-sensitive badger information is shown in Appendix 8.15 and on Figure 8.8 and sett information is detailed in the Confidential Annex.

#### Brown Hare and Mountain Hare

- 8.11.33 Brown hares were often observed from the vehicle on tracks within the large conifer plantation area in the eastern part of the site. The animals were particularly often seen on the ascent of Three Mullach Hill after the crossing of the Dryfe Water. No mountain hares were recorded.

#### Red Squirrels

- 8.11.34 Red squirrels *Sciurus vulgaris* were commonly sighted out with the survey area by surveyors travelling to and from the site but rarely within the survey area. There were several records of red squirrel from the camera trap survey of the Silton Forest area. Cones stripped by squirrels were found where the survey areas extended into conifer plantations. It is not possible to eliminate grey squirrel from feeding signs alone. Six baited hair tubes were set-up in the south of the site where it was felt the habitat was most suited to squirrels due to the maturity of the trees and the proximity to areas of deciduous woodland. No dreys were located.
- 8.11.35 The locations are shown on Figure 8.9.

#### Pine Marten

- 8.11.36 There were no direct observations of pine marten during the course of fieldwork on site but there were one or two instances of scats being found that were thought to belong to this species. The most conclusive evidence of presence was collected from one of the baited hair traps set-up in the south of the site where



the paired camera traps recorded a brief view of a marten at the edge of Siltan Forest. The first location of a scat was at the side of the forestry access track at Finniegill Burn NY 15685 99315 in summer 2017. The second location of a scat was at the eastern edge of the Siltan Forest. Fountain Forestry's ecological surveyor (pers comm David Smith) found a scat (2019) at approximately NY 17261 94708, in coniferous plantation.

8.11.37 The locations are shown on Figure 8.9.

#### Other Mammals

##### Deer

8.11.38 Roe deer *Capreolus capreolus* were often seen using the edges of the conifer woodland and feeding out on to the moorland. There were no observations of red deer *Cervus elaphus* or sika deer *Cervus nippon*.

##### Rabbits

8.11.39 Rabbit *Oryctolagus cuniculus* warrens to the northeast of the site provide a significant food source for the golden eagle.

##### Fox *Vulpes vulpes*

8.11.40 Droppings, tracks and paths were commonly recorded throughout the site.

##### Mole *Talpa europaea*

8.11.41 Molehills are common in some areas including well into the forest alongside the forest roads and in the lower open grazed areas.

##### Field Vole *Microtus agrestis*

8.11.42 Occasional animals seen on the moorland and rough grazing, with latrines and runs noted in grassy and rush covered areas.

#### Reptiles

##### Common Lizard

8.11.43 Common Lizard was recorded occasionally on the moorland areas of the site. Records are shown in Appendix 8.16

#### Amphibians

8.11.44 Frogs and occasionally toads were recorded in wet areas on the open ground and within the forest, particularly in spring.

#### Butterflies and moths

8.11.45 Scotch Argus *Erebia aethiops* was recorded frequently along the verges of forestry access tracks in the eastern part of the site, particularly in the Siltan Forest and Rue Gill Forest areas. Small heath butterflies *Coenonympha pamphylus* were very common throughout the site. In the summer of 2019, Painted Lady butterflies *Vanessa cardui* were recorded in the eastern parts of the site, both in lower areas such as the tracksides in the Siltan Forest and along watercourses such as the northern part of the Dryfe Water. Common Blue *Polyommatus icarus* was found in a small area of species-rich grassland (NY 17419 94448) in

the Siltan Forest, along a stretch of forestry track where Scotch Argus was present in good numbers in late summer 2018. Small Pearl-bordered Fritillary *Boloria selene* was also seen at the above location, and also in other areas of damp or marshy grassland and marshy woodland rides throughout the site. Peacock *Aglais io*, Small Tortoiseshell *Aglais urticae* and Red Admiral *Vanessa atalanta* were seen often generally throughout. Other butterflies regularly recorded were Green-veined White *Pieris napi*, Orange Tip *Anthocharis cardamines*, Meadow Brown *Maniola jurtina*, Small Copper *Lycaena phlaeas* and Ringlet *Aphantopus hyperantus*.

8.11.46 Emperor Moth *Saturnia pavonia* was occasionally observed in heather moorland habitat, such as on Scaw'd Fell. The Common Footman moth *Eilema lurideola* was frequently seen along the edges of forest areas during a summer visit in 2019.

#### Fish

8.11.47 The series of fish surveys extended over a significant area of the Dryfe Water and Wamphray Water catchments, straddling main tributaries with their own specific physical and geological features. Each tributary has its own riparian habitat type and characteristics and as a consequence, fish population densities and diversity has varied from watercourse to watercourse. The location of the fish surveys is shown on Figure 8.6.

8.11.48 Results are given in Appendix 8.17. The survey concludes that, in the watercourses surveyed within the vicinity of the proposed Scoop Hill Wind Farm:

- Both the Dryfe Water and Wamphray Water sub-catchments were assessed to contain habitat features that are optimal for salmonids;
- Atlantic salmon are currently absent from the upper reaches of the Wamphray Water, closest to the Scoop Hill wind farm, historically excluded from that area by a culvert at the railway line and the natural waterfalls in Wamphray Glen;
- Despite some doubts regarding the ability of adult salmonids to ascend the Wamphray Glen waterfalls, good numbers of returning adult salmon and trout in the Wamphray Water sub-catchment are predicted in the future following population re-establishment after recent installation of a new fish pass at the culvert, on the basis of the good quality habitat;
- Good numbers of salmonids were recorded in the Dryfe Water sub-catchment, where the population has remained stable in line with results over the Annan catchment;
- Stone loach *Barbatula barbatula* has been recorded on all surveys of the Wamphray Water sub-catchment, though limited to low gradient stretches and should be expected in the lower reaches; and
- European eel *Anguilla anguilla* is currently absent from both sub-catchments but is expected to re-colonise given the extent of suitable habitat, following the removal of a barrier currently in place at the foot of the River Annan;

8.11.49 Several locations in the watercourses were classed as being 'excellent' or 'good' due to the number of salmonids per 100m<sup>2</sup>. These included the locations 'Wy4', 'Wy3', 'Wy8' and 'Wy9' below the Wamphray Glen waterfalls where numbers of both salmon and trout fry were noted as 'excellent'. On the Dryfe Water, the locations 'De3', 'De4', 'DeS11' and 'De9' were 'excellent' for trout fry, and 'De7' at the confluence of the Dryfe Water and Stoney Gill was given as 'good' for numbers of salmon fry.

#### Evaluation of Ecological Features

8.11.50 Appendix 8.18 provides an evaluation of the ecological value of the habitat IEFs recorded within the site and Appendix 8.19 provides an evaluation of the ecological value of the species IEFs.

## 8.12 Assessment of Impacts

### Construction and Operational Impacts

8.12.1 The vast majority of impacts relating to the development of wind turbines within the ZOI are associated with the construction phase. Loss or disturbance to significant habitats can be significant and can also have long-term impacts on species through potential loss of breeding and/or foraging habitat, or important wintering habitat. Construction activities themselves can result in disturbance of species through lighting, noise or potential pollution incidents, as well as potential injury to species due to site clearance works such as digging of borrow pits or turbine bases.

8.12.2 Potential impacts which could occur as a result of the operation of the wind farm relate largely to risk of collision for bats.

8.12.3 There are also potential disturbance issues relating to noise of the operational turbines, as well as higher levels of disturbance resulting from an increase in visitors to the site. This could result in displacement of certain sensitive species from the area, resulting in a change in the local distribution and/or abundance of species. Operational impacts could occur over the operational lifetime of the wind farm, although some species may become habituated to the conditions on site so these impacts may lessen over time.

8.12.4 The potential impacts associated with the habitats and species of importance recorded in the area are detailed below. The significance of these impacts is assessed first of all in the absence of any mitigation.

### Western Southern Uplands and Inner Solway Natural Heritage Zone

8.12.5 There are a number of objectives and actions addressing the priorities of the Western Southern Uplands and Inner Solway Natural Heritage Zone. The ones likely to be impacted upon are:

- To encourage sustainable rural development and to maintain and restore semi natural habitats in farmland in lowland and upland areas and enhance linkages and corridors;
- To maintain and enhance landscapes, including designed Landscapes, coast, lowland and upland farmland, woods and forests, and geological and geomorphological sites;
- To encourage natural river processes, maintain sustainable aquatic biodiversity including fish populations, and improve water quality and riparian habitat throughout river catchments; and
- To maintain populations of characteristic species and increase overall species diversity.

8.12.6 The Proposed Development has the potential to adversely affect semi natural habitats and landscapes in forest and in farmland in upland areas. There is also the potential to adversely affect the aquatic environment. However, there is also the potential to enhance habitats and species diversity. These effects are dealt with in the sections below.

### Designated Sites

8.12.7 There is only one designated site with potential habitat connections to the development site, Dryfe Water SSSI, along the southern edges of the developable site.

8.12.8 There will be no loss of habitat from the designated site or other direct impacts. The only risk is a negative impact along the edge of the site to the watercourse from silt and other pollutants during the construction phase of the wind farm. The potential for negative impacts is considered to be **negligible**.

### Habitats

#### Impacts of Construction

8.12.9 Direct impacts of construction take the form of loss of habitat through land-take for infrastructure construction such as turbine bases, access tracks, site compounds, electricity substation and borrow pits.

8.12.10 Indirect impacts of construction include: changes to existing hydrology that could lead to detrimental changes in wetland habitats as a result of increased drainage and/or dewatering; increased pollution risk associated with accidental spillages of fuels and oils; increases in silt-laden run-off and fugitive dust emissions; changes to current land management (e.g. grazing regimes).

8.12.11 The dimensions used to calculate habitat loss are given in Appendix 8.20 and the amounts of the various habitats that will be lost due to the development footprint (based on the 500m buffer around the turbines) can be seen in Appendix 8.21.

8.12.12 A total of approximately 105.34 ha of habitat would be lost to the development. The direct impacts are generally considered to be **low in magnitude** and of **low significance** given the size of the study area, approximately 8,573 ha. The loss of blanket bog, wet modified bog and dry modified bog is approximately 4.2% of the total bog habitats and therefore assessed as being of **low magnitude, of minor significance and permanent**. The direct impacts on all habitats are low with less than 5% of each habitat resource being lost. Direct impact on other affected habitats is considered to be **minor, hence of minor significance**, due to their small size or low conservation value.

8.12.13 There is no direct loss of GWDTE habitat.

#### Other Construction Impacts

8.12.14 During the construction phase there is scope generally for negative impacts on habitats through the following:

- Spillage of fuels and lubricants associated with vehicles and machinery;
- Spillage of cement;
- Leaching of alkalis into the soil during construction of the turbine bases;
- Deposition of excavated material onto surrounding vegetation communities;
- Disruption to the flow of groundwater; and
- Discharge of silt into watercourses.

8.12.15 Indirect impacts are also likely and are detailed below.

#### Short Term Impacts

8.12.16 If disturbed ground is left bare after all construction operations are completed, erosion of loose material is likely to take place after heavy rain, with a likely loss of soil and established plant species through further erosion and with a risk of vegetation communities down-slope being buried and damaged.

8.12.17 Run-off carrying silt has high potential to pollute watercourses affecting aquatic vegetation and potentially fish and otters.

#### Long Term Impacts

8.12.18 Increased levels of drainage will arise following the construction of cut tracks and turbine crane hardstands. Where new cut tracks follow contour lines, downslope areas can be deprived of normal water flow as it may be diverted away by new drains that lie beside the tracks. However, the design of the wind farm and associated infrastructure has been designed to avoid areas of groundwater dependency.

8.12.19 Significant negative impact is possible on wetland habitats such as bog, wet heath, and marshy grassland or flush.

8.12.20 Drying conditions would lead to the ground no longer being able to support the current diversity of water-loving plants and some conversion over time of habitats such as marshy grassland to dry grassland. It is not possible to quantify changes to the vegetation, but a qualitative negative impact of medium to low magnitude of moderate significance is likely for habitats dependent on either surface water flows or groundwater.

8.12.21 If disturbed soil is left bare for too long after working, for instance, along the edges of the tracks or around turbine areas and crane hardstands, grasses or rushes are likely to temporarily benefit. These changes are likely to be noticed in a fairly short period of time. Prolific seeders, notably Soft Rush *Juncus effusus*, can colonise very quickly.

8.12.22 If bare soil areas are sown with specific species in order to stabilise them, there is the further possibility of preferential grazing by farm livestock of these sown areas on the young fresh growth.

8.12.23 Direct outflow from cross drains onto wet areas with silty or saturated soil can cause damage to vegetation through scouring during times of heavy rainfall. The resulting erosion is very hard to repair and can lead to significant damage over a long period of time.

8.12.24 The positioning of tracks can cause fragmentation of habitat with a resulting loss of capacity for genetic exchange between the newly-separated areas.

8.12.25 It is possible that construction materials foreign to the site may import seeds of plants that do not belong in the habitats or invasive pest species and permit their establishment on disturbed areas.

8.12.26 The construction will result in a mixture of temporary and permanent impacts. Many negative impacts will be negligible however some, such as the drying of bog habitats, have the potential to disrupt the flow of water within wetland habitats/GWDTEs and cause water pollution. The latter are considered to be negative, of **medium magnitude, permanent** and of **moderate significance** and **reversible**.

#### Operational Impacts

8.12.27 Potential operational impacts include disturbance to flora and fauna resulting from turbine operation and maintenance and any changes in land management, such as changes to grazing.

8.12.28 Operational checks, servicing and repair will be undertaken on the turbines on a routine basis following the commissioning of the new wind farm. Since all movement of vehicles will be undertaken using the existing and new access tracks, there will be no additional disturbance to the habitats.

8.12.29 A possible impact is that run-off from the surfaces of the access tracks, could contaminate watercourses and water bodies.

8.12.30 No changes in the management of the site are expected following the construction of the wind farm. The open moorland and pasture will continue to be used for the grazing of livestock. Forestry management and operations will continue as before in the commercial plantations.

8.12.31 It is considered that this impact will be of **low magnitude, long term** and therefore of **minor significance** and **reversible**.

#### Species

##### Bats

##### Impacts of construction

8.12.32 One bat roost was located at Finniegill in the eastern part of the site, counted in 2019 and found to contain around 20 bats. Both Soprano or Common Pipistrelles were recorded, as well as Brown Long-eared bat so it is likely that both species are using the buildings at Finniegill, perhaps with separate small roosts at various locations in either the main dwelling house and/or an adjacent shed. A significant seasonal increase in activity was noted along the track on the eastern slopes of Three Mullach Hill during a drive-round transect in late August 2018, corresponding to the time when young bats would be flying. Static detectors placed near the turbine locations and along the track on the eastern slopes recorded a high number of pipistrelle passes in early September 2019. The increased activity is almost certainly at least partially due to higher numbers of animals after the emergence of the young bats, as well as other undetermined seasonal factors.

8.12.33 The bat roost at Finniegill will not be impacted physically by the construction of the wind farm. The house is over 500m away from the nearest turbine. Additionally, the dwellings at Finniegill and their access track running alongside the Dryfe Water are not included within the construction activity footprint.

8.12.34 There is a possibility of the foraging habitat of the Finniegill bats being subject to a negative impact during construction. Construction activities would be confined to the west side of the ridge along the existing access track and, with most of the likely disturbance of habitat along the centre of the ridge for the construction of new access tracks and turbine pads. Those areas were found to have less activity during the above seasonal peak, with most activity recorded along the busier eastern track.

8.12.35 The level of disturbance would depend otherwise on the time of the year, with any construction work undertaken during spring and summer having greater potential impact. Given that the infrastructure locations are of less significance to the bats, that the construction work is normally undertaken during the months of autumn and winter, and that in the event of spring or summer working, bat activity is likely to take place outside of normal construction hours, any negative impact is likely to be a **low magnitude** and of **negligible significance**.

8.12.36 Bats were recorded foraging and commuting in low numbers within the site near the turbine locations. Therefore, bats could potentially be directly impacted by loss of foraging/commuting habitat associated with construction of the wind farm, as well as indirect impacts via disturbance during the construction period and upgrading of existing forestry tracks. The majority of the bats recorded were along woodland edges so there is likely to be negligible impact on the moorland areas of the development site where the infrastructure is to be located. There is more likely to be disturbance along plantation edges. The level of impact will be dependent on the time of year. If construction takes place during spring or summer, the negative impact has



the potential to be greater. However, since bats feed at night and return to roost early morning their activity time is likely to be outside construction hours. Negative impacts of construction are considered to be of **low magnitude, short term** and of **minor significance**.

#### Impacts of operation

- 8.12.37 The roost at Finniegill appears to contain both Common and Soprano Pipistrelle bats. These species are both common and widespread in the UK. They are both considered to be at medium risk of collision with wind turbines. Given the propensity of both species to utilise more productive edge habitats, as evidenced by the varying activity levels recorded on Three Mullach Hill, and the likelihood that the bats will fly at lower levels generally when present in the poorer habitat at the specific turbine locations, the risk to the foraging pipistrelles is considered to be low. Nevertheless, it remains likely that a small number of pipistrelles might be killed through collision with the turbines. This negative operational impact is considered to be of **low magnitude, long term** and **minor significance**.
- 8.12.38 The great majority of records of bats using the site were for Common and Soprano Pipistrelle, which are both common and widespread species in the UK. Those two species and the additional 50kHz pipistrelles) accounted for around 98% of all transect passes. The Brown Long-eared bat is also one of the most common and widespread species but was recorded very rarely during survey only by the remote detectors. Noctule or *Myotis* bats, that are both less common and less widespread than the above, were also recorded, in much smaller numbers (both a little over 1% of all transect passes).
- 8.12.39 In general, low numbers of bats were recorded crossing the moorland areas where some of the turbines are to be located. Common and Soprano Pipistrelle bats are considered to be at medium risk from collision with wind turbines, since they spend a proportion of the time flying at higher heights. *Myotis* bats and Brown Long-eared bat are considered to be at low risk as these species have been determined to forage at low heights for almost all the time. Noctule bats are considered to be at high risk from collision with wind turbines since they spend much of their time flying at height.
- 8.12.40 In view of the small numbers and the great majority of records from the higher open areas being of pipistrelle species, collision risk is considered to be low in this area. The majority of the bats recorded were on the forest edges. There is therefore a greater collision risk at the turbines situated adjacent to the forest. The impact on bats from the operational wind farm is considered to be of **medium magnitude, long term** and **moderate significance**.

#### **Otters**

##### Impacts of construction

- 8.12.41 There is the potential for impacts on otters through direct habitat loss and disturbance during the construction phase. However, the turbine locations themselves are unlikely to impact on otters and the loss of habitat is considered **negligible**.
- 8.12.42 Otter holts and lie ups are not likely to be impacted upon by turbine bases, tracks or any other infrastructure. Several lie ups were recorded on the Dryfe however these were destroyed by felling works in 2019. Disturbance and displacement during construction is considered to be of a **low magnitude, short term** and of **minor significance**.
- 8.12.43 There is potential for indirect impacts as a result of deterioration in water quality due to pollution incidents during construction. In addition, there is also the potential for otters to become injured or trapped by falling

into deep excavations associated with borrow pits or construction of turbine bases. The indirect negative impact of construction is considered to be of **medium magnitude, short term** and of **moderate significance**.

##### Impacts of operation

- 8.12.44 Although otters have been recorded within the site, it is considered that this species is unlikely to suffer any significant negative impacts from the operation of the wind farm. As otters are mostly active at dusk and dawn there is unlikely to be any significant disturbance to this species due to an increase in visitor numbers. The impact is considered to be negligible.

#### **Badgers**

##### Impacts of construction

- 8.12.45 There is unlikely to be any significant loss of habitat due to construction of the turbine bases and access tracks, just a small loss of foraging habitat. Badger activity is very high and due to the very large size and density of the forest, setts will probably have been missed. Setts are most likely to be lost due to felling operations within the forest however with current information it appears no setts will be lost due to wind farm construction as none were located within 100m of any part of the development. Badger setts will move as forest operations take place. However, it is generally felt that the negative impact on badgers due to habitat loss is considered **low magnitude, long term** and of **minor significance**.

##### Impacts of operation

- 8.12.46 There could however be some disturbance to badgers during the construction phase, due to noise and vibration associated with construction activities, particularly the excavation of borrow pits. However no sett was located within 100m of any proposed infrastructure. As above with otters, there is also the potential for badgers to become injured or trapped by falling into deep excavations associated with borrow pits or construction of turbine bases. It is therefore considered probable that the negative impacts could be of **low magnitude, short term** and of **minor significance**.

#### **Brown Hare**

##### Impacts of construction and operation

- 8.12.47 There will be minor disturbance to this species during construction, however generally the negative impacts of the development are considered **negligible**. It is also likely that the negative impacts of the operating wind farm will be **negligible**.

#### **Red Squirrel**

##### Impacts of construction and operation

- 8.12.48 Red squirrels are present in low numbers. Forest operations will have an effect on this species and populations will move according to where there are mature trees with cone crops. Disturbance during construction could be caused by tree removal with potential to destroy dreys. However, the negative impacts are considered to be of **low magnitude, short term** and of **minor significance**.
- 8.12.49 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Pine Marten**Impacts of construction and operation

- 8.12.50 Pine martens too are present only in small numbers. Disturbance during construction could be caused by tree removal with potential to destroy dens. However, the negative impacts are considered to be of **low magnitude, short term** and of **minor significance**.
- 8.12.51 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Deer**Impacts of construction and operation

- 8.12.52 There is some potential for negative impacts for roe deer during construction of the proposed wind farm due to noise and vibration associated with construction activities. However, this is considered to be **negligible**.

**Common Lizard**Impacts of construction and operation

- 8.12.53 Common lizard has the potential to lose some habitat on the moorland section of the wind farm. Although the amount of direct habitat loss is small and the impact is considered to be of **low magnitude, long term** and of **minor significance**.
- 8.12.54 However, there is the potential that there could be negative impacts during construction of the proposed wind farm through the risk of injury due to site clearance works. If ground clearance takes place from early spring to late summer, there is the likelihood of disturbance to breeding habitat. If during autumn and winter, then there is the risk of disturbing hibernating animals. The impact is considered to be of **medium magnitude, short term** and of **moderate significance**.
- 8.12.55 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Migratory Salmonids**Impacts of construction and operation

- 8.12.56 As the development is proposed for above and adjacent to many of the watercourses containing migratory salmonids there is a possibility of a negative impact on the population due to silt and other water pollutants. Culverts and bridges can cause problems for fish trying to pass upstream and downstream. The effects of construction and operation have the possibility of being of **high magnitude, long term** and of **major significance**.

**Amphibians**Impacts of construction and operation

- 8.12.57 There will be a small loss of habitat for amphibians. If construction takes place during the spring or summer, there could potentially be an impact if there is silt run off into small ponds and construction on wetter areas of the moor. The effects of construction are considered to be of **low magnitude of minor significance**. The effects of the operational wind farm are considered **negligible**.

**Butterflies and moths**Impacts of construction and operation

- 8.12.58 The loss of habitat for feeding adults and caterpillars will be **negligible** and the effects of construction and operation are also considered to be **negligible**.

**Decommissioning Impacts**

- 8.12.59 Although difficult to anticipate the extent of impacts, which could result due to decommissioning of the site at this time, potential issues are likely to relate to disturbance associated with removal of turbines and turbine bases and other infrastructure. Given that the vehicles involved in decommissioning will be able to use the existing infrastructure it is unlikely that there will be further significant habitat loss. Impact on protected species is expected to be similar to that during construction, although slightly reduced.

**8.13 Mitigation**

- 8.13.1 A Habitat Management Plan (HMP) including a Species and Habitat Protection Plan has been written as part of a programme of mitigation measures associated with the construction and operation of the Scoop Hill Community Wind Farm. An Outline version of the HMP has been submitted in support of the S36 application. This will be designed to minimise any negative impacts on habitats and species. There is also the possibility of gaining a positive impact on the site through careful mitigation design to enhance existing retained habitats for notable species recorded on the site, which would assist the Local Authority/Scottish Government in discharging its biodiversity duty.
- 8.13.2 It is proposed that the HMP is a working document which will evolve following discussions between the developers, the landowners, the ECoW and organisations with responsibility for and an interest in key wildlife species such as the Biodiversity Officer, NatureScot, SEPA and the RSPB to develop an effective and workable plan for the site. The priority will be to:
- Examine ways to minimise disturbance and possible problems for key species;
  - Examine how the value might be improved by changes in land management; and
  - Increase overall biodiversity through management targeted at specific species.
- 8.13.3 A brief outline of mitigation for each habitat and species is provided below but will be covered in further detail in the Outline HMP.
- 8.13.4 An Ecological Clerk of Works (ECoW) will be employed to ensure compliance with planning regulations and ensure protection of habitats and wildlife.
- Habitats**
- 8.13.5 The locations for all infrastructure including turbine bases, tracks, borrow pits, site storage area and temporary construction compounds have already been chosen to reduce impact on the most important habitats and avoiding GWDTEs.
- 8.13.6 The Construction and Environmental Management Plan (CEMP) will include a constraints map detailing all GWDTEs. These will also be included in the SEPA Construction Site Licence with details on avoidance, or measures to greatly reduce negative impacts. Mitigation measures to ensure hydrological connectivity will include the following:

- Floating tracks;
  - Piping where necessary;
  - No settlement ponds or silt traps will be placed within GWDTE habitats;
  - Any pumping of turbine water will be within GB15 and will not be discharged directly on to GWDTE but discharged in a manner that allows it to flow back into the hydrological pathway;
  - Highly dependent GWDTE will be identified onsite and reviewed in detail by the ECoW when the Pollution Prevention Plan is being drafted to ensure that each is properly protected against potential changes to the water supply patterns around these GWDTEs;
  - All mitigation will be designed and identified in the PPP to the satisfaction of SEPA; and
  - Prior to construction, the footprint of the wind farm will be walked by the ECoW with the site engineer and the GWDTEs identified where civil works may impact upon them. Any alterations will be discussed with SEPA and any amendments made to the Construction Site Licence as required.
- 8.13.7 Improvements are likely to be possible by applying the micro-siting allowance of up to 100m enabling fine adjustments to be made in the field, with the ECoW able to confirm up to 50m and with 50m to 100m requiring approval from SEPA.
- 8.13.8 Robust surface water management measures including suitably sized attenuation ponds in groups of three, silt traps and silt nets will be put in place following good practice and these will be overseen by and agreed with the ECoW. All locations of the pollution prevention measures will be detailed in the SEPA Site Construction Licence.
- 8.13.9 Construction phase impacts resulting from pollution by fuels, oil, servicing chemicals and leaching from cement will be avoided by the adoption of best working practices, choice of the most appropriate cement mix and design of servicing areas.
- 8.13.10 During the construction period, the working area will be kept to a minimum to avoid unnecessary peripheral habitat disturbance and the accumulation of unnecessary amounts of loose material that might be washed away during periods of heavy rain.
- 8.13.11 Good practice will be followed to design an effective drainage system to allow proper distribution of water to down slope areas. Where cut tracks are used, these will have cross pipes inserted at suitable intervals to spread out the supply of water.
- 8.13.12 The outflow from cross drains will be carefully designed to vent diffusely, close to the ground, and will be positioned to avoid areas with silty or saturated soil.
- 8.13.13 Floating tracks will be used to traverse mire habitats, allowing water to pass underneath the track, or through its lower layers. They will also be used where peat depths are greater than 0.5m.
- 8.13.14 Where flush habitat has to be crossed, an additional lower layer design will be used with perforated pipes spaced over the width of the flush and set within a matrix of open graded free draining material wrapped in separator geotextile.
- 8.13.15 Regular inspections will be made to check whether the drainage systems remain operating as intended. This should ensure a proper supply of water for sensitive communities.
- 8.13.16 Best practice will be employed during and after deep excavations for turbines and borrow pits. Settling ponds will be used to store excess water accumulating in the excavation areas. Clean filtered water from the

settling ponds will be released in appropriate areas, maintaining water supply to downslope wetland communities.

- 8.13.17 Turves with vegetation representative of the site from excavation work will be stored for use in dressing the disturbed edges around the infrastructure. This will prevent the erosion of loose soil and colonisation by undesirable plant species.
- 8.13.18 Some of the habitat enhancement at Scoop Hill will focus on improving the condition of the upland habitat complex of heathland and mire. These habitats have been subject to management by burning and drainage for many years and heavily grazed, leading to a loss of diversity.
- 8.13.19 Habitat enhancement at Scoop Hill will also aim to improve the condition of the upland habitat mire complex. The habitats have been subject to much drainage and grazing for many years. Much blanket bog has been slowly converted to poorer quality dry modified bog. The dry modified bog has been identified as having the potential for recovery and it is anticipated that it would respond well to a programme of grip-blocking and a reduction in grazing pressure.
- 8.13.20 Where the topography is suitable, there is potential for increasing the value of the mire habitats by creating the conditions for basin mire during the restoration of borrow pits. Few examples of basin mire are currently found in the study area and the former borrow pits provide an opportunity to increase the number.
- 8.13.21 Habitat enhancement will also include the establishment of cleuch woodland. At present very little broadleaved woodland exists at the site. The biodiversity of the site would be improved for many species including black grouse, merlin, and songbird populations and would enrich the available habitat for ring ouzel, such as the habitat in the upper Dryfe Water valley.

### Species

#### Bats

- 8.13.22 To minimise the potential for disturbance to bats during the construction process, tree felling will be undertaken in winter or early spring when bats are less likely to be active. If any construction works are undertaken during the active season for bats, construction activities will be limited to daylight hours and no work is undertaken at dawn or dusk near to preferred foraging areas for bats. This would limit the potential for disturbance to bats by avoiding the need for night-time lighting on site, which could deter foraging around the site, but would also attract moths to the lights encouraging bats to feed around them.
- 8.13.23 To minimise the potential for collision, turbines will be placed a minimum distance of 50m from the tip of the turbine blade from the forest edges.
- 8.13.24 Broad-leaved tree and scrub planting within the cleughs and along watercourses away from turbine locations will enhance foraging opportunities. Bat boxes will be erected in suitable locations such as at farmhouses and in woodland distant from the turbines.
- 8.13.25 If the above recommendations are put in place, this would reduce the potential of disturbance and displacement and risk of collision on bats so that it is considered that a negative impact will be of a **low magnitude and of low significance**.

### Otters

- 8.13.26 A large amount of the access track generally avoids crossing watercourses. However where it is necessary to cross them, a pre-construction survey for otters will be carried out to determine the current status of otter on the site at that time and ensure that, if there has been any recent change in otter activity around the site, any necessary mitigation measures, which have been proposed, can be implemented where necessary.
- 8.13.27 The ECoW, in liaison with the construction engineers, will ensure the location of the access tracks and structures are more than 30m from a potential holt or lie-up (100m for a breeding holt), a strict precautionary method of working will be set in place by the ECoW. This may necessitate an application for a European Protected Species Licence (EPSL) from NatureScot prior to any works being carried out. However, it may also be possible to avoid any potential for disturbance to otters by careful timing of the works and sensitive working methods, depending on the proximity of the holt/lie up to the works, and thereby avoid the need for a licence.
- 8.13.28 Watercourse crossings have been identified in the Hydrology assessment (Section 10 of the EIAR, Technical Appendix 10.1). Should the access track require to be altered, any culverts or bridges will be designed with sufficient headroom to allow passage by otters along watercourses, including during spate conditions, and to maintain water quality and flow. This may necessitate the inclusion of ledges and diversionary fences to facilitate movement, however the specific design will be agreed with SEPA/NatureScot prior to construction.
- 8.13.29 Any scrub woodland or other dense vegetation, beside watercourses, will be retained to provide suitable cover for lie-up areas and facilitate movement of otters through the site. Site contractors will be informed of any sensitive areas to ensure no accidental disturbance to holts or resting places.
- 8.13.30 If culverts or piping are to be stored on site, these will be capped to avoid entrapment of otters inside. In addition, any excavations over 0.5m deep, such as turbine bases or borrow pits, will be covered over at night or ramped on one side to enable otters to escape if they fall in. Temporary fencing will also be installed around these excavations to avoid animals falling in.
- 8.13.31 Strict pollution prevention measures will be implemented to ensure no impacts on water quality, which could have indirect impacts on the otter population. These will include standard good practice measures to control silt levels, oil and fuel spills. Water monitoring and inspections will be carried out.
- 8.13.32 If all the above recommendations are put in place, it is considered that the impact of the construction of the wind farm is likely to be of a **low magnitude** and **not significant**. Enhancement measures for otter will also be implemented, including planting up riparian corridors within the cleughs with species such as willow, alder, ash, hazel, hawthorn and blackthorn to increase cover/refuge opportunities for this species. A number of attenuation ponds will be designed to be wildlife friendly and will be left on site for amphibians thus providing a food source for otters. If these enhancement measures are put in place it is probable that this may have a **positive** impact on otter within the Zone of Influence due to the additional cover facilitating movement through the site.

### Badgers

- 8.13.33 A pre-construction check will be made on the site to check existing setts and for any newly excavated setts, which could be impacted by the construction. If identified, a 30m buffer zone will be implemented around any setts to avoid any potential disturbance to badgers inside during the construction process. Disturbance will be avoided during the breeding season (December to June). These buffer zones will be set up by the

ECoW on site who will monitor badger use of the site during construction to further assess the disturbance impacts associated with construction and advise construction workers if any changes are necessary. Setts within 100m of a borrow pit will require a license from NatureScot and excavation of them will not take place during the period December to June. Exclusion of badgers from setts will not be considered unless it is really necessary.

- 8.13.34 Sources of seasonal food will be included in the HMP such as planting of fruit trees e.g. gean, elder, apple and plum.
- 8.13.35 The mitigation which has been recommended to avoid otters becoming trapped in piping or excavations on site during the construction process will also ensure the protection of badgers. It is therefore extremely unlikely that there would be a significant impact on badgers due to the construction of the proposed wind farm and negative impacts are considered to be **negligible**. Planting to improve foraging opportunities is likely to result in a **positive impact** on badgers.

### Red Squirrels

- 8.13.36 A pre-construction check will take place where all key-hole felling is due to take place to check for dreys. To reduce the impact on breeding squirrels, all felling will take place out with the breeding season. No broad-leaved tree planting will take place within the forest as this may attract grey squirrels. Adverse impacts are considered to be of **low magnitude, temporary** and **minor significance**.

### Pine Marten

- 8.13.37 A pre-construction check will take place where all felling is to take place to check for pine marten dens. To reduce the impact on breeding animals, all felling will take place out with the breeding season. Pine marten denning boxes will be erected, and this will be out with the conifer plantation in areas of broad-leaved woodland in order that they are more likely to prey upon grey squirrels rather than red. Adverse impacts are considered to be of **low magnitude, temporary** and **minor significance**.

### Migratory salmonids, lampreys and eels

- 8.13.38 Robust surface water management measures will be put in place following good practice and overseen by the ECoW. Water quality monitoring will take place. All infrastructure will be located a minimum of 50 m from any watercourse. Culverts and bridges will be designed to allow fish passage at all times and their construction agreed with the ECoW and the River Annan District Salmon Fishery Board. With these measures in place the impact can be reduced to a **low magnitude, short term**, possibly even **negligible** and **not significant**.

### Reptiles

- 8.13.39 Carrying out ground clearance out with the spring and summer months will minimise disturbance to reptiles. However, there is the possibility of disturbing hibernating reptiles. Any suitable hibernaculum's that require to be removed for construction such as stone walls will be de-constructed in July (post breeding and prior to hibernation). This will be overseen by the ECoW. New hibernaculum's will be constructed on site on moorland. With these measures in place, the negative impact can be reduced to **negligible** with some **positive effects**.

### Amphibians

- 8.13.40 As with reptiles, avoiding ground clearance in spring and summer will minimise disturbance to amphibians.
- 8.13.41 Strict pollution prevention measures during construction will minimise the risk of pollution to wet areas and ponds.
- 8.13.42 Habitat enhancement will also take place including creation of wildlife friendly attenuation ponds for construction which will be left on site following completion of construction. With these measures in place, the negative impact can be reduced to **negligible** with some **positive effects**.

### Decommissioning Impacts

- 8.13.43 If the recommendations given above to avoid significant impacts on habitats and species during construction of the wind farm are also implemented during the decommissioning phase, it is probable that there would be **no significant impacts** during decommissioning of the wind farm site. However, this would need to be re-assessed at a later stage taking into consideration the actual status of species and habitats present on the wind farm site at that time.

### Residual Effects

- 8.13.44 Residual effects following mitigation are summarised in Appendix 8.23. Following mitigation, negative impacts on habitats will be of varying magnitudes but the majority can be considered to be of a **low magnitude**, possibly even **negligible, temporary** and **not significant**.
- 8.13.45 GWDTEs can be avoided and mitigated for and the adverse impacts are also considered to be of a **low magnitude**, possibly even **negligible, temporary** and **not significant**.
- 8.13.46 The impact on bats during construction is considered to be of low magnitude and minor significance and of medium magnitude, long term and moderate significance. However, if good practice is followed and mitigation put in place, this can be reduced to **low magnitude** and of **minor significance** with the potential for some **positive** impact.
- 8.13.47 There is potential for otters to be adversely affected during construction. However, with strict pollution measures in place and mitigation the effects can be reduced to **negligible**.
- 8.13.48 If good practice is followed and mitigation put in place, the development is extremely unlikely to have a significant negative impact on badgers. There are opportunities for positive impact through improving foraging opportunities.
- 8.13.49 By covering excavations whilst not in use, the impact on deer will be **negligible**.
- 8.13.50 Potential adverse effects on common lizard are **negligible** with some **positive effects**.
- 8.13.51 The effects of construction and operation have the possibility of being of **high magnitude, long term** and of **major significance** for migratory salmonids. With strict pollution control the effects can be reduced to **low magnitude** of **minor significance** and **temporary**.
- 8.13.52 With mitigation, the site will provide **positive** benefits for amphibians.

- 8.13.53 Off-site habitat enhancements will provide **positive** benefits for butterflies and other invertebrates.
- 8.13.54 With mitigation at Scoop Hill, the residual effect on habitats and species is considered to be of **low magnitude** and of **minor significance**.

### Assessment of Cumulative Residual Effects

- 8.13.55 The primary concern regarding the assessment of cumulative effects is to identify situations where the effects on habitats and species although acceptable at an individual development may be more significant if combined with adjacent developments. There are a number of other developments within the Natural Heritage Zone.
- 8.13.56 There are a number of other developments in the area, which need to be considered in terms of cumulative impacts. These include operational, consented/under construction and wind farm applications currently going through the planning process. A list of developments within 20km falling within the Natural Heritage Zone and adjacent NHZ are detailed in Appendix 8.22.
- 8.13.57 There are potentially 12 wind farms within the NHZ and adjacent Border Hills NHZ. Many of these have similar habitats and species.
- 8.13.58 Table 8.10 outlines the impacts on habitats and species at a number of adjacent wind farms within 20km of Scoop Hill for which EIAs were available.

**Table 8.10 - Cumulative Impacts of Wind Farms and other Developments within the NHZ**

Development	Predicted Impacts on habitats and species
Hopsrig	No significant residual effects associated with the Proposed Development, during construction, operation, and decommissioning of the Proposed Development on habitats or bats
Minnygap	The operation of the wind farm was not predicted to give rise to any significant impacts on habitats or species.
Ewehill and Extension	Habitats mainly wet modified bog and marshy grassland, no significant impact. No significant impact on otter holts or bats. No long term impacts to any protected species.
Harestanes	Following implementation of mitigation measures, no residual significant negative effects were predicted on habitats or protected species
Clyde	Negligible impact on bog habitats. Impacts on otters, badgers, red squirrels, common lizard, adder, and brown trout all predicted to be low.
Clyde Extension	No significant residual effect on blanket bog. A cumulative assessment predicted no significant effects on ecology.
Solwaybank	Short term effects predicted for badger, red squirrel, low potential collision risk for bats, some loss of bog habitats.
Crossdykes	Minor loss of bog habitats. No significant effect on bats, otters, badgers, sea trout or salmon.
Loganhead	Most habitat loss is commercial forestry; other habitat loss is low and not significant. Development not considered a threat to otters, bats, badgers or red squirrel.
Earlshaugh	Effect on otters negligible, mitigation measures to reduce impacts on blanket bog habitat and fish, and effect on herptiles negligible.
Faw Side	Loss of bog habitat, no significant impact on badgers, otters, red squirrels or migratory fish. Predicted significant impacts on bats at a study area level as

	low population and limited bat activity.
Whitelaw Brae	Otters required a species protection plan, negligible effects on badger, red squirrel, bats, reptiles and fish.

- 8.13.59 The various adjacent wind farms within the NHZ will mean a cumulative loss of a variety of habitats. There will be varying amounts of loss of several of the habitats of national value across all these sites. However, the majority of the EIAs conclude no or minor significant impacts to habitats. With mitigation at Scoop Hill, the cumulative residual effect is therefore considered to be of **low magnitude** and of **minor significance**.
- 8.13.60 With regard to species, these additional developments, together with the proposed wind farm are likely to result in some negative impacts due to additional direct loss of habitat suitable for foraging and refuge for the wildlife, which has been recorded in the area, as well as negative impacts due to higher levels of disturbance/displacement over a much wider area. However, as the Scoop Hill Wind Farm proposal would not appear to have a significant negative effect on species of conservation concern, the cumulative impact is considered to be of **low magnitude** and of **minor significance**.

#### 8.14 Statement of Significance Summary

- 8.14.1 The scope of the ecological assessment was determined through a combination of desk study, fieldwork, consultation and analysis of the combined data. Fieldwork included a Phase 1 habitat survey, NVC survey and field assessment for protected species.
- 8.14.2 It is considered that the development of the wind farm was likely to have only a few negative impacts on the habitats of the site including loss of blanket bog, drying of bog habitats and potential water pollution. However, a series of measures are described to minimise the impact on habitats and the HMP includes compensatory measures, thus ensuring that the negative impacts are generally of low magnitude, of low significance or negligible.
- 8.14.3 Positive effects can also be achieved including bog restoration, native tree planting and enhancements for many species including otter, badger, pine marten, amphibians and reptiles.
- 8.14.4 Whilst there is potential to disturb and displace various protected species including bats, otters, badgers and reptiles, care has been taken to avoid disturbance of these protected species. Any potential negative impacts have been mitigated for and it will be possible to comply fully with wildlife protection legislation.

**Appendix 8.1 — Bat Activity Transect Routes**

Transect Number	Survey area	Route
1	Gillesbie	Walk-round survey of open farmland and rough grazing (semi-improved acid grassland with some moorland relics), in southern part of the site (around Gillesbie Hill, Loft Shaws and Peat Hill).
2	Laverhay Height	Walk-round survey of open moorland and blanket bog, starting at upper limit of improved pasture near Laverhay Farm, including Milne Height, Heatherybrae Head and Laverhay Height, ending along the edge of the Laverhay Forest conifer plantation.
3	Dundoran and Broadfield Height	Walk-round survey commencing in western part of the site at Dundoran Plantation (fairly mature coniferous trees) and out over rough grazing/moorland edge on Broadfield Height descending to improved pasture above Leithenhall Farm.
4	Black Hill, Rue Gill Hill and Dryfe Water	Walk-round survey along varied age coniferous plantation at Black Hill then out over heather moorland on Ruegill Hill, down to and along edge of gully (Duncan's Cleuch) then along estate track (edged by immature broadleaved trees and scrub) to Dryfehead Bothy. (NB Original design of route (circular route from Dryfehead Bothy out onto Peat Rig and over Ruegill Hill then back to bothy via Duncan's Cleuch) was changed for the sake of health and safety (heath and bog habitat with metre-deep grips on Peat Rig is too dangerous to cross in poor light)).
5	Three Mullach Hill	Follows forestry access tracks around Three Mullach Hill and ridge to the west of Finniegill Burn, using both drive-round survey on solid tracks and walk-round on shorter sections through northern part. Samples a variety of forestry habitats: track-edges, clear-fell, clear-fell/re-plant and young conifer plantation (mostly recently established but with a few more mature sections, one since felled).
6	Silton Forest	Mainly drive-round survey of Silton Forest, using forestry access tracks through mainly pre-felling age plantation blocks, crossing Dryfe Water in two places, along the edge of one un-planted blanket bog relic; this route was occasionally divided up between drive-round survey and walk-round survey depending on logistics/to suit practical considerations.

## Appendix 8.2 — Bat Transect Survey Dates, Times and Weather

Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
Gillesbie					
1	15/05/2018	21.00	23.50	Start temp: 10.9°C; end temp: 9.7°C; cloud cover 100%; wind at start WNW 2-3, at end NNW 3; no precipitation	Alan Wood Dougie Irving
1	25/06/2018	22.06	00.55	Temp 15°C; cloud cover 60%; wind 0-1; no precipitation	Jamie Manners Liam Flynn
1	09/08/2018	20.15	23.30	Temp 13°C; cloud cover 80%; wind 0-1; no precipitation	Jamie Manners Diane Lyons
1	15/10/2018	18.20	20.35	Start temp: 10°C; end temp: 7°C; Start temp: 10°C; end temp: 7°C; wind: 2E; cloud cover 10% at start, 90% at finish; dry at start, intermittent light rain from 19.30 on	Jamie Manners Davy Galbraith
Laverhay					
2	14/05/2018	21.25	00.20	Start temp: 11°C; end temp 9.8°C; cloud cover: 0%; wind: SSW 1; no precipitation	Jamie Manners Alan Wood
2	12/07/2018	21.54	00.30	Start temp: 16°C; end temp: 10°C; wind at start: 0-1, no direction, at end N 2; cloud cover 0%; no precipitation	Liam Flynn Davy Galbraith
2	09/08/2018	20.28	23.15	Start temp: 13.5°C; end temp: 11.5°C; cloud cover 95% at start, 40% at end; brief shower at start, c20.28	Liam Flynn Davy Galbraith
2	15/10/2018	18.05	20.21	Start temp: 8°C; end temp 6°C; cloud cover 5%; wind: 2 E; no precipitation	Alan Wood Seumas Harris
Dundoran					
3	14/05/2018	21.00	00.15	Start temp 12°C; end temp 9.5°C; wind at start 0, no direction, at end NE1; no precipitation	Dougie Irving Davy Galbraith
3	12/06/2018	21.56	00.22	Start temp: 11.5°C; end temp: 9°C; cloud cover 10%; wind at start W1, at end W0-	Jamie Manners Alan Wood

Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
				1; no precipitation	
Transects cancelled due to turbines being withdrawn from the scheme					
Rue Gill Hill					
4	17/05/2018	21.15	00.00	Start temp: 14°C; end temp 11°C; cloud cover 75%; wind NE 0-1; no precipitation	Liz Parsons Jamie Manners
4	04/06/2018	21.47	00.22	Start temp: 14°C; end temp: 9°C; cloud cover 100% at start, 100% at end; wind at start 0, no direction, at end NE 1; no precipitation	Dougie Irving Davy Galbraith
4	26/06/2018	22.25	00:10	Start temp: 18°C; end temp 15°C; wind at start SE 1, at end S E2; cloud cover 40%; no precipitation	Liam Flynn Alan Wood
4	25/07/2018	21.15	23:30	Start temp: 14.5°C; temp at end: 10°C; wind at start NE 0-1, at end NE 1; cloud cover 25%; no precipitation	Jamie Manners Liam Flynn
4	27/08/2018	20.30	22.55	Start temp: 12°C; end temp: 10°C; wind at start 0-1, no direction, at end NE 1-2; no precipitation	Karen McCaul Jamie Manners
Three Mullach Hill					
5	17/05/2018	21.15	00.15	Start temp: 14°C; end temp 10°C; cloud cover 25%; wind at start S 0-1, at end NE 0-1; no precipitation	Diane Lyons Liam Flynn
5	04/06/2018	21.45	24:00	Start temp not given; end temp not given; cloud cover 100%; wind at start NE 0-1, at end NE 1; no precipitation	Alan Wood Jamie Manners
5	26/06/2018	22.29	00.30	Start temp: 18.5°C; end temp 17.2°C; wind at start SE 1, at end S E2; cloud cover 30%; no precipitation	Jamie Manners Davy Galbraith
5	27/08/2018	20.52	22.35	Start temp: 12°C; end temp: 10°C; wind at start 0-1, no direction, at end NE 1-2; cloud cover 50%; no precipitation	Alan Wood Davy Galbraith



Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
5	02/10/2018	18.50	21.25	Start temp: 10°C; end temp: 7°C; wind at start NW 2, at start NW 2, at end NW 2; cloud cover 50%; no precipitation	Liam Flynn Davy Galbraith
Silton Forest					
6	15/05/2018	21.15	23.32	Temp at start: 12.5°C; temp at end: 11.1°C; wind at start W 0-1, at end W 1-2; cloud cover 100%; no precipitation	Jamie Manners Davy Galbraith
6	11/07/2018	02.44	04.47	Temp at start: 14°C; temp at end: 9°; wind at start 0-1, no direction, at end NE 1-2; cloud cover 30%; no precipitation	Liam Flynn Davy Galbraith
6	11/07/2018	02:48	04:48	Temp at start: 11°C; temp at end: 9°; wind at start 0, no direction, at end NE 1; cloud cover 25%; no precipitation	Jamie Manners Alan Wood
6	25/07/2018	21.24	22.46	Temp at start: 14.5°C; temp at end: 10°C; wind at start NE 0-1, at end NE 1; cloud cover 20%; no precipitation	John Speirs Davy Galbraith
6	02/10/2018	18.56	21.05	Temp at start: 9°C; temp at end: 7°C; NW 2; cloud cover 30%; no precipitation	Jamie Manners Alan Wood
6	02/10/2018	18.50	21.30	Temp at start: 10°C; temp at end: 7°C; wind at start NW 2, at end NW 2; cloud cover 50%; no precipitation	Liam Flynn Davy Galbraith

**Appendix 8.3 – Locations of Static Recorders, Dates and Times**

Detector Number	Location	Dates	Recording times
<b>Cluster 1 Dundoran</b>			
1	NY 12622 98175 (on edge of older spruce stand adjacent to ride and younger stand)	30/05/2018 to 04/06/2018	21.10 to 05.10
2	NY 12590 99544 (on fencepost at wall junction west of Burnt Mound)		
3	NY 13091 99534 (on wall on Broadfield Height)		
4	NT 12687 00643 (SE of cairn on Craig Fell)		
<b>Cluster 2 Gillesbie</b>			
<b>Spring 2018</b>			
1	NY 15427 94976 (on snag within Tilhill clearfell/re-plant on Gudewife's Hill)	05/06/2018 to 12/06/2018	21.18 to 05.18
2	NY 15978 95178 (on upright branch of fallen tree beside Sembletree Burn)		
3	NY 16187 93680 (at north east corner of new plantation on lower slopes of Gillesbie Hill)		
4	NY 15768 93423 (on birch tree at edge of former conifer plantation)		
<b>Summer 2018</b>			
1	NY 15427 94976	25/07/2018 to 01/08/2018	20.45 to 05.45
2	NY 15978 95178		
3	NY 16187 93680		
4	NY 15768 93423		
<b>Autumn 2018</b>			
1	NY 15427 94976	02/09/2018 to 07/09/2018	
2	NY 15978 95178		
3	NY 16187 93680		
4	NY 15768 93423		
<b>Cluster 3 Ramshaw</b>			
<b>Spring 2018</b>			
1	NY 16069 97123 (on dead snag on Ramshaw Rig in young replant after clearfell)	21/05/2018 to 29/05/2018	20.57 to 05.15
2	NT 16617 00871 (on tree-trunk on western slopes above Dryfe Water)		
3	NT 16152 00903 (on young spruce at turning circle on Rue Gill Hill)		

4	NY 17317 97586 (on tall spruce on eastern slopes above Dryfe Water)		
<b>Summer 2018</b>			
1	NY 17317 97586 (on tall spruce on eastern slopes above Dryfe Water)	16/07/2018 to 24/07/2018	20:35 to 05:35
2	NT 16152 00903 (on young spruce at turning circle on Rue Gill Hill)		
3	NT 16617 00871 (on tree-trunk on western slopes above Dryfe Water)		
4	NY 16069 97123 (on dead snag on Ramshaw Rig in young replant after clearfell)		
<b>Autumn 2018</b>			
1	NY 17317 97586	03/10/2018 to 15/10/2018	18:10 to 07:50
2	NT 16152 00903		
3	NT 16617 00871		
4	NY 16069 97123		
<b>Cluster 4 Silton</b>			
<b>Spring 2018</b>			
1	NY 19227 95550 (beside forestry track on snedded tree)	14/05/2018 to 18/05/2018	20:40 to 05:30
2	NY 19129 95121 (in clearing behind stalkers' shed on ash tree)		
3	NY 18056 96248 (on willow at edge with conifer plantation and blanket bog relic)		
4	NY 17141 96048 (on conifer at plantation edge along main forestry track)		
<b>Summer 2018</b>			
1	NY 19129 95121	13/06/2018 to 18/06/2018	21:30 to 05:30
2	NY 19227 95550		
3	NY 18056 96248		
4	NY 17141 96048		
<b>Autumn 2018</b>			
1	NY 19129 95121 (in clearing behind stalkers' shed on ash tree)	27/08/2018 to 07/09/2018	19.18 to 07.18
2	NY 19227 95550 (beside forestry track on snedded tree)		
3	NY 18056 96248		
4	NY 17141 96048		
<b>Cluster 5 South Loch Fell (2019)</b>			

Spring 2019			
1	NT 17196 03578 (On post on Dun Moss)	27/06/2019 to 06/07/2019	21:28 to 04:53 (SM2+)
2	NT 17252 03063 (At southern end of South Loch Fell on post)		
Summer 2019			
1	On post on Dun Moss	16/07/2019 to 27/07/2019	21:00 to 05:30 (SM2+)
2	NT 17252 03063 (At southern end of South Loch Fell on post)		
Cluster 6 Three Mullach Hill (2019)			
Spring 2019			
1	NY 16675 97877 (on dead snag in clearfell/recent re-plant)	16/04/2019 to 26/04/2019	19.00 to 08.30 (SM2+)
2	NY 16862 97261 (on snag in recent clearfell/re-plant)		
3	NY 16978 97477 (Beside forest track on branch)		
4	NY 16614 97416 (beside track, clearfell)		
August 2019			AudioMoth run
1	NY 16675 97877	21/08/2019 to 31/08/2019	19:40 to 06:35 (AudioMoth)
2	NY 16862 97261		
3	NY 16978 97477		
4	NY 16614 97416		
September 2019			SM2+ run
1	NY 16675 97877	10/09/2019 to 20/09/2019	19:15 to 07:10
2	NY 16862 97261		
3	NY 16978 97477		
4	NY 16614 97416		

**Appendix 8.4 – Badger Sett Definitions**

<b>Sett Type</b>	<b>Definition</b>
Main	Several holes with large spoil heaps and obvious paths emanating from and between sett entrances.
Annexe	Normally less than 150 m from main sett, comprising several holes. May not be in use all the time, even if main sett is very active.
Subsidiary	Usually at least 50 m from main sett with no obvious paths connecting to other setts. May only be used intermittently.
Outlier	Little spoil outside holes. No obvious paths connecting to other setts and only used sporadically. May be used by foxes and rabbits.

**Appendix 8.5 – Fish Survey Locations**

Watercourse	Site code	Tributary	Easting	Northing	Altitude (m)
Dryfe Water	De0.5	Duncan's Cleugh	316585	601385	357
	De3		317050	599900	300
	De4		317221	598310	270
	DESI1	Stoney Gill	317172	596673	256
	DE7		317180	596644	254
	DeCe1	Capel Burn	317175	594684	207
	De8		317257	594658	206
	De9		318610	593994	203
Wamphray Water	Wy0.5		314912	601326	225
	WY1		313875	599125	170
	Wy6		313610	597190	152
	Wy7		313400	596880	152
	Wy2		312939	596526	131
	Wy8		311900	596200	117
	Wy3		311900	596200	89
	Wy4		311169	595618	75
	Wy5		310959	595359	73

## Appendix 8.6 – Designated Sites within 20 km of Scoop Hill Wind Farm

## Statutory Sites

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
<b>European Designated Sites</b>			
River Tweed SAC	1.6km to the north	Biological: River Lamprey <i>Lampetra fluviatilis</i> , Brook Lamprey <i>Lampetra planeri</i> , Otter <i>Lutra lutra</i> , Sea Lamprey <i>Petromyzon marinus</i> , Atlantic Salmon <i>Salmo salar</i> , Watercourses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation/Rivers with floating vegetation often dominated by water-crowfoot.	No direct habitat connections No potential for impacts.
Moffat Hills SAC	5.6km to the north	Biological: Alpine and subalpine heaths, blanket bog, and plants in crevices on base-rich rocks, dry heaths, tall herb communities, montane acid grasslands, plants in crevices on acid rocks, acidic scree.	No direct habitat connections No potential for impacts.
Langhom-Newcastleton Hills SPA	15.4km to the east	Supports a breeding population of European importance of Annex 1 species Hen Harrier <i>Circus cyaneus</i> .	No direct habitat connections No potential for impacts.
<b>National Designated Sites</b>			
Lochwood SSSI	1.4km to the west	Biological: Wood pasture and parkland, purple hairstreak ( <i>Neozephyrus quercus</i> , lichen assemblage), Lochmaben Lochs SSSI (Biological: Eutrophic loch, open water transition fen, beetle assemblage, fly assemblage.	No direct habitat connections No potential for impacts.
Lochmaben Lochs SSSI	12.3km to south west	Biological: Eutrophic loch, Open water transition fen, Beetle assemblage, Fly assemblage.	No direct habitat connections No potential for impacts.
Castle Loch SSSI	13.7km	Biological: Goosander <i>Mergus merganser</i> , Greylag Goose <i>Anser anser</i> , Pink-footed Goose <i>Anser</i>	No direct habitat connections No potential for impacts.

		<i>brachyrhynchus</i> .	
Shiel Dodd SSSI	12.9km to the west	Biological: Upland assemblage including blanket bog, subalpine dry dwarf-shrub heath, and calcareous types of spring-head, rill and flush.	No direct habitat connections. No potential for impacts.
Perchhall Loch SSSI	6.7km to south west	Biological: Basin fen and beetles.	No direct habitat connections. No potential for impacts.
Black Loch SSSI	14.2km to south west	Biological: Basin fen.	No direct habitat connections. No potential for impacts.
Dryfe Water SSSI	At edge of 500m around turbines and within the developable site	Biological: Upland mixed ash woodland	Potential for some impact on site margins.
Locharbriggs Quarry SSSI to the south west	19.5km	Geological: Fossilised wind-blown sand dunes of Permian Triassic age.	No potential for impacts.
Bigholms Burn SSSI to the south east	16.8km	Geological: Quaternary Geology and Geomorphology: Quaternary of Scotland.	No potential for impacts.
Tweedsmuir Hills SSSI	15.6km to the north	Biological: Upland habitats, Upland assemblage, Vascular plants, Vascular plant assemblage, Bryophyte assemblage, Non-vascular plants, Birds, Breeding bird assemblage.	No direct habitat connections No potential for impacts.
Craigdilly SSSI	15.7km to the north	Biological: Sub-montane scrub.	No direct habitat connections No potential for impacts.
Kingside Loch SSSI	18.3km to north east	Biological: Basin fen-schwingoor type, Bryophyte assemblage, Oligotrophic loch.	No direct habitat connections No potential for impacts.

**Non-statutory Sites within 20km (representative sample for Ancient Woodland and Long-established Woodland sites, WDSB = Within developable site boundary)**

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
<b>Listed Wildlife Sites</b>			
None			
<b>Local Nature Reserves</b>			
Castle and Hightae Lochs	13.7km	(Containing Castle Loch SSSI) Open water and birds, woodland.	No direct habitat connections. No potential for impacts.
<b>Ancient woodland/Long-established woodland sites</b>		There are over 700 areas of these woodlands within 20km to the west and south of the site. A small sample is provided of those within the developable site and up to 3km outside the site boundary	
Un-named riparian woodland of Wamphray Water	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Other (on Roy map).	No potential for impacts.
Milne Wood	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Other (on Roy map).	No potential for impacts.
LONG PLANTATION	WDSB	Small potential for impacts.	No potential for impacts.
Un-named	Adjacent	Ancient (of semi-natural origin).	No potential for impacts.
WHATE PLANTATION	0.2km	Long-Established (of plantation origin).	No potential for impacts.
The Pinnacle	WDSB	Long-Established (of plantation origin).	No potential for impacts.
Blaze Plantation	143m	Long-Established (of plantation origin).	No potential for impacts.
Oakrig Plantation	940m	Long-Established (of plantation origin).	No potential for impacts.
Whinny Plantation	WDSB	Long-Established (of plantation origin).	No potential for impacts.
Beldcraig Wood	Adjacent	Long-Established (of plantation	No potential for impacts.

		origin).	
Elf Knowe	252m	Long-Established (of plantation origin).	No potential for impacts.
<b>Other sites</b>			
Eskdalemuir Red Squirrel Priority Woodland	Overlaps site	Priority Area for Red Squirrel Conservation.	Potential for impacts.

## Appendix 8.7 – Desktop Results Habitats and Species

Common Name	Source	Location and distance from development
<b>LICHENS</b>		
<i>Lobaria pulmonaria</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta fuliginosa</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta limbata</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta sylvatica</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta sylvatica</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Nephroma laevigatum</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Parmeliella triptophylla</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<b>PLANT SPECIES</b>		
Juniper <i>Juniperus communis</i>	SWSEIC RADSFB	Silton Forest, within site River Annan, adjacent to location of access track.
<b>MAMMALS</b>		
Red Squirrel <i>Sciurus vulgaris</i>	SWSEIC RADSFB	Silton Forest, within site.
Pine Marten	Fountain Forestry, David Smith, pers comm	Silton Forest, within site.
Badger	SWSEIC Ewan Braid, pers comm Philip Roskell, pers comm	Dundoran Plantation, within site. Broadfield Height, within site. Laverhay Sclanders, within site.
Common Pipistrelle <i>Pipistrellus</i>	SWSEIC	Greengate Head, near Black Esk valley, c500m outside site to east.
Pipistrelle roost	SWSEIC	Black Esk, c500m east of site boundary.
Pipistrelle roost	Finniegill owner	Finniegill, within area encompassed by windfarm, but outside of developable site.
Red Deer <i>Cervus elaphus</i>	SWSEIC	Laverhay Sclanders and Dryfe Water valley, within site.
Sika Deer <i>Capreolus capreolus</i>	SWSEIC	Adjacent to site, on the east side of Silton Forest.
Eurasian Pygmy Shrew	SWSEIC	In area adjacent to north west corner of site.
Eurasian Common Shrew	SWSEIC	In area adjacent to north west corner of site.
<b>INVERTEBRATES</b>		
Small Pearl-bordered Fritillary <i>Boloria selene</i>	SWSEIC	Silton Forest, within site.
Small Heath Butterfly <i>Coenonympha pamphylus</i>	SWSEIC	Silton Forest, within site and other broad locations at margins of the windfarm site.
<b>FISH</b>		
Atlantic Salmon <i>Salmo salar</i>	SWSEIC RADSFB	Black Esk, c500m east of site boundary River Annan, adjacent to location of access track.
Brown/Sea <i>Salmo trutta</i>	SWSEIC	Black Esk, c500m east of site boundary.
European Eel <i>Anguilla anguilla</i>	SWSEIC	Black Esk, c500m east of site boundary.
Chub <i>Leuciscus cephalus</i>	RADSFB	River Annan, adjacent to location of access

		track.
Pike <i>Esox lucius</i>	RADSFB	River Annan, adjacent to location of access track.
Brook Lamprey <i>Lampetra planeri</i>	RADSFB	River Annan, adjacent to location of access track.
Flounder <i>Platichthys flesus</i>	RADSFB	River Annan, adjacent to location of access track.
Perch <i>Perca fluviatilis</i>	RADSFB	River Annan, adjacent to location of access track.
Three-spined stickleback <i>Gasterosteus aculeatus</i>	RADSFB	River Annan, adjacent to location of access track.
Minnnow <i>Phoxinus phoxinus</i>	RADSFB	River Annan, adjacent to location of access track.
Grayling <i>Thymallus thymallus</i>	RADSFB	River Annan, adjacent to location of access track.
Bream <i>Abramis brama</i>	RADSFB	River Annan, adjacent to location of access track.
Carp <i>Cyprinus carpio</i>	RADSFB	River Annan, adjacent to location of access track.
Roach <i>Rutilus rutilus</i>	RADSFB	River Annan, adjacent to location of access track.
Bullhead <i>Cottus gobio</i>	RADSFB	River Annan, adjacent to location of access track.
<b>REPTILES AND AMPHIBIANS</b>		
Common Lizard <i>Zootoca vivipara</i>	SWSEIC	Gallatae, within windfarm area.
Slow-worm <i>Anguis fragilis</i>	SWSEIC	Near Dryfehead Bothy, within windfarm area.



## Appendix 8.8 – NVC Descriptions

The following NVC communities were identified on the survey site as either communities in their own right or as components in intermediate communities. Site-specific descriptions of the vegetation and species occurring in each community can be found in Section 8.9 Phase 1 Habitat survey and NVC Communities Survey. Further details of the vegetation at individual locations can be found in the extensive target notes.

### W1 *Salix cinerea-Galium palustre* woodland

NVC W1 woodland is found mainly in the lowlands along the margins of watercourses and in wet hollows. The canopy is usually dominated by *Salix cinerea* with occasional associates such as *Betula pubescens* or *Alnus glutinosa*. *Galium palustre*, *Juncus effusus* and *Mentha aquatica* are the most common field layer species. There can be other scattered wetland plants such as *Angelica sylvestris*, *Filipendula ulmaria*, *Equisetum fluviatile* and *Caltha palustris*.

### 'WSx' (Willow scrub woodland)

The code 'WSx' has been used in the NVC survey report and on the maps to indicate small patches of willow-dominated vegetation that is not referable to NVC W1 above. The small areas can have mixtures of willow species where *Salix cinerea*, *Salix aurita* and *Salix caprea* have colonised drier soils. There are several scraps of such vegetation scattered alongside some of the forestry tracks and on dry embankments. The field layer is variable, with some weedy vegetation and grasses such as *Holcus lanatus* or *Deschampsia cespitosa*. *Juncus effusus* and *Rubus fruticosus* can be frequent.

### W7 *Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum* woodland

*Alnus glutinosa* is usually the most abundant canopy species in the wet woodland NVC W7, with occasional *Fraxinus excelsior* or *Betula pubescens*. Understorey species depend on the dampness of the soils. *Crataegus monogyna* and *Corylus avellana* commonly occur on drier soils, while on damper ground *Salix cinerea* is often found. *Lysimachia nemorum*, *Filipendula ulmaria*, *Urtica dioica*, *Athyrium filix-femina*, *Chyrsosplenium oppositifolium*, *Holcus mollis* and *Poa trivialis* are common in the field layer.

### W9 *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland

NVC W9 is a community found on somewhat base-rich soils. The canopy is made up of mixtures of *Fraxinus excelsior*, *Ulmus glabra*, *Sorbus aucuparia* and *Betula pubescens*, often with *Corylus avellana*. Typical field layer species can include *Mercurialis perennis*, *Urtica dioica*, *Viola riviniana*, *Primula vulgaris* and *Geum urbanum*. Dryopterid ferns can be prominent.

### W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland

This is a dry type of woodland where the canopy consists mainly of Sessile Oak *Quercus petraea* and Downy Birch *Betula pubescens* often with some Rowan *Sorbus aucuparia*. Hazel *Corylus avellana* and Holly *Ilex aquifolium* can be common in an understorey layer. The field layer is usually grassy, though sometimes ferns are prominent, mainly *Pteridium aquilinum*. Common grasses are Common Bent *Agrostis capillaris*, Creeping Soft-grass *Holcus mollis* and Sweet Vernal-grass *Anthoxanthum odoratum*. Bryophytes can be abundant. Feathermosses are usually prominent, such as *Thuidium tamariscinum*, *Rhytidadelphus squarrosus* and *Hylocomium splendens*.

### W21 *Crataegus monogyna-Hedera helix* scrub

The main scrub species in NVC W21 is usually *Crataegus monogyna* but *Prunus spinosa* can also be common and can dominate in some stands. There is often *Rubus fruticosus* and *Rosa* spp. There is frequently a carpet of *Hedera helix* underneath the scrub species. *Galium aparine*, *Urtica dioica* and *Mercurialis perennis* are common associates.

### W23 *Ulex europaeus-Rubus fruticosus* scrub

*Ulex europaeus* or *Cytisus scoparius* dominates in NVC 23. *Rubus fruticosus* is the most common underscrub associate and sometimes there is some *Rubus idaeus* or *Pteridium aquilinum*. The field layer often contains typical species from acid grassland such as *Agrostis capillaris*, *Galium saxatile* and *Potentilla erecta*. Other variants include weedy elements with species such as *Senecio jacobaea* or have a rank grassland field layer with species such as *Arrhenatherum elatius*.

### M2 *Sphagnum cuspidatum/fallax* bog pool community

NVC M2 is a community of bog pools, wet hollows, soakways and seepage lines. *Sphagnum fallax* and *Sphagnum cuspidatum* account for most of the vegetation, accompanied by other bog species such as *Sphagnum papillosum*, *Erica tetralix*, *Eriophorum* spp and other sedge species.

### M4 *Carex rostrata-Sphagnum fallax* mire

*Carex rostrata* dominates this NVC community. It is accompanied sparsely by a few other vascular species that include *Potentilla erecta*, *Agrostis canina* and various sedges. The bryophyte layer often includes *Sphagnum denticulatum*, *Sphagnum papillosum*, *Sphagnum palustre* and *Polytrichum commune* as well as the constant *Sphagnum fallax*.

### M6 *Carex echinata-Sphagnum fallax/denticulatum* mire

NVC M6 mire is common throughout the survey area. Most examples belong to either the *Juncus acutiflorus* sub-community M6d, dominated by *Juncus acutiflorus*, or sub-community M6c, dominated by *Juncus effusus*. Those sub-communities are characterised by the dominant rush species growing over a carpet of bog-mosses, mainly *Sphagnum fallax*, with some *Sphagnum palustre*, and frequently *Polytrichum commune*. Associates include *Carex nigra*, *Carex echinata*, *Agrostis canina*, *Viola palustris* and *Rumex acetosa*.

### M10 *Carex dioica-Pinguicula vulgaris* mire

This community is characterised by a group of sedges that includes *Carex hostiana*, *Carex dioica*, *Carex panicea*, *Carex flacca* and *Carex viridula* ssp. *oedocarpa*, accompanied by *Pinguicula vulgaris*. There can be a few other vascular associates such as *Briza media*, *Linum catharticum*, *Erica tetralix* and *Drosera rotundifolia*. The ground is covered in a layer of calcicolous bryophytes, among them *Ctenidium molluscum*, *Campylium stellatum*, *Blindia acuta*, *Scorpidium scorpiodes* and *Drepanocladus* spp.

### M15 *Trichophorum cespitosum-Erica tetralix* wet heath

Mixtures of *Trichophorum germanicum*, *Erica tetralix*, *Calluna vulgaris* and *Molinia caerulea* define the typical sub-community, M15b. Associates include *Nathecium ossifragum*, *Potentilla erecta* and *Eriophorum angustifolium*. The grassy NVC M15d *Vaccinium myrtillus* sub-community is characterised by *Nardus stricta*, *Deschampsia flexuosa* and *Juncus squarrosus* along with *Vaccinium myrtillus*.

### M17 *Trichophorum germanicum-Eriophorum vaginatum* mire

NVC M17 mire is characterised by mixtures of *Eriophorum vaginatum*, *E. angustifolium*, *Trichophorum germanicum* and *Molinia caerulea* with patches of *Calluna vulgaris* and *Erica tetralix*. The bog-mosses are mainly *Sphagnum papillosum* and *Sphagnum capillifolium* with *Aulacomnium palustre* and some liverworts.

### M18 *Erica tetralix-Sphagnum papillosum* mire

Only small areas of mire are classified as NVC 18. They are similar to NVC 17, with an increased proportion of *Sphagnum* mosses, and, critically, the presence of *Sphagnum magellanicum*. These mires are very localised.

**M19 *Calluna vulgaris-Eriophorum vaginatum* mire**

*Calluna vulgaris* and *Eriophorum vaginatum* are predominant in this community that generally contains a lesser proportion of bog-mosses than either NVC M17 or NVC M18. Common vascular associates are *Vaccinium myrtillus*, *Eriophorum angustifolium* and *Empetrum nigrum*. On the highest ground there is often *Vaccinium vitis-idaea* and *Rubus chamaemorus*. Bog-mosses are typically represented by *Sphagnum capillifolium*, but wetter areas have *Sphagnum papillosum* and *Sphagnum fallax*. *Aulacomium palustre* can be also be present in wetter areas. Hypnoid mosses are frequent, including *Hypnum jutlandicum* and *Pleurozium schreberi*. Where bog-moss forms tight hummocks, there is often *Polytrichum strictum*.

**M20 *Eriophorum vaginatum* mire**

NVC M20 community is found on some of the high peaty ridges on the site - and often extends down shallow slopes – where grazing has been heavier. The chief characteristic of the vegetation is dominance by tussocky *Eriophorum vaginatum*. The community encompasses both Phase 1 categories of dry modified bog (E1.8) and wet modified bog, with *Molinia caerulea* playing an increased role in transitional communities (E1.7). The community is characterised by tussocky *Eriophorum vaginatum* domination, often with acid grassland elements and hypnoid mosses. Stands with the lowest diversity have been coded as M20a species-poor sub-community. Better quality examples have been coded as M20b *Calluna vulgaris-Cladonia* species sub-community. In the latter there is usually a small proportion of *Calluna vulgaris* and *Vaccinium myrtillus* can be well represented. Bog-mosses are usually limited to *Sphagnum capillifolium* and *S. fallax*. Hypnoid mosses, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Hylocomium splendens* are usually more prominent in the *Eriophorum* tussocks.

**M23 *Juncus effusus/acuteiflorus-Galium palustre* rush-pasture**

This community is widely distributed throughout the site in ditches, along the margins of watercourses or in valley bottoms or on sloping ground within damp pastures. There are two sub-communities. The M23a sub-community is dominated by *Juncus acuteiflorus* and the M23b sub-community is dominated by *Juncus effusus*. The M23b sub-community dominated by *Juncus effusus* can be rather species-poor, grassy or weedy, with associates such as *Rumex acetosa*, *Cirsium palustre* and *Ranunculus repens*. The M23a *Juncus acuteiflorus* sub-community can be quite species-rich with associates such as *Filipendula ulmaria*, *Galium palustre*, *Lotus pedunculatus*, *Mentha aquatica*, *Succisa pratensis*, *Lychnis flos-cuculi*, *Cirsium palustre*, *Viola palustris*, *Ranunculus* spp. and *Rumex acetosa*. Common mosses are *Calliergonella cuspidata*, *Polytrichum commune* and *Pseudoscleropodium purum*. Many heavily drained stands contain acid grassland elements, giving a type of vegetation not yet included in the NVC, and are difficult to code at NVC level.

**M25 *Molinia caerulea-Potentilla erecta* mire**

NVC 25 community is dominated by *Molinia caerulea*, sometimes overwhelmingly so, and *Potentilla erecta* is present at usually low frequency. The community occurs frequently on sloping ground or extending from different mire types on blanket bog onto thinner peat. The M25a *Erica tetralix* sub-community, including elements from bog and heath such as *Erica tetralix* and *Calluna vulgaris*, is commonest. The grassier M25b sub-community is also quite common. That has acid grassland species such as *Nardus stricta*, *Anthoxanthum odoratum* and *Festuca ovina*. There are a few examples of the more herb-rich and marshier M25c sub-community with associates such as *Succisa pratensis*, *Angelica sylvestris* and *Mentha aquatica*. Frequent transitional forms have been mapped, between M25 and mires such as M20 or M15. There are also marshy or flushed communities that are intermediate between M25 and NVC M23, and also drier communities that are intermediates with various acid grassland communities (U4, U5 and U6 grasslands).

**M37 *Palustriella commutata-Festuca rubra* spring**

A few small mossy flushes add to the floristic diversity locally, referable to NVC M37 *Palustriella commutata-Festuca rubra* spring. They are indicated by target notes since they are too small to map. Bryophyte associates include *Philonotis fontana* etc. *Festuca rubra* and small sedges such as *Carex flacca*, *Carex panicea*, and *Carex viridula* are scattered sparsely through the mosses.

**H10 *Calluna vulgaris-Erica cinerea* heath**

Mixtures of *Calluna vulgaris* and *Erica cinerea* characterise NVC H10 heath, typically accompanied by *Galium saxatile*, *Potentilla erecta* and *Carex binervis*. Underneath the vascular plants is a bryophyte layer of *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Hypnum jutlandicum*.

**H12 *Calluna vulgaris-Vaccinium myrtillus* heath**

This community is very well represented across the open ground at the site. *Calluna vulgaris* is dominant in NVC H12, usually with subordinate *Vaccinium myrtillus* and hypnoid mosses (*Hypnum jutlandicum*, *Pleurozium schreberi*, *Hylocomium splendens* and *Rhytidiadelphus squarrosus*) with few other associates at any frequency. Transitions from heather-dominated NVC H12 to drier blanket bog (NVC M19) are common and are often obscure where a fairly uniform cover of shrubby heather forms a monotonous canopy.

**H18 *Vaccinium myrtillus-Deschampsia flexuosa* heath**

NVC H18 *Vaccinium-Deschampsia* heath occurs rarely in the site, in small patches at higher elevations. A few intermediate communities were mapped as intermediate between dry heath (dominated by *Vaccinium*) and acid grassland types such as in 'U5-H18'. NVC H18 is usually the result of heavy grazing of NVC H12 heath that has removed *Calluna vulgaris*.

**MG1 *Arrhenatherum elatius* grassland**

Coarse-leaved, bulky grasses such as *Dactylis glomerata*, *Holcus lanatus* and, usually most abundant, *Arrhenatherum elatius*, dominate NVC MG1. Umbellifers can be prominent, such as *Anthriscus sylvestris* and *Heracleum sphondylium*. Sprawling or climbing plants are common: *Rubus fruticosus*, *Galium aparine*, *Lathyrus pratensis* and *Vicia* spp. Other frequent associates are *Urtica dioica*, *Cirsium arvense*, *Centaurea nigra*, *Achillea millefolium*, *Plantago lanceolata* and *Rumex acetosa*.

**MG5 *Cynosurus cristatus-Centaurea nigra* grassland**

NVC MG5 is herb-rich grassland where the main grasses are fine-leaved species such as *Festuca rubra*, *Cynosurus cristatus*, *Agrostis capillaris* and *Anthoxanthum odoratum*. *Dactylis glomerata* and *Holcus lanatus* can be found but are not prominent in the vegetation. A large proportion of the community is made up by herbs such as *Centaurea nigra*, *Plantago lanceolata*, *Trifolium repens*, *T. pratense*, *Lotus corniculatus*, *Ranunculus* spp., *Prunella vulgaris* and *Rhinanthus minor*.

**MG6 *Lolium perenne-Cynosurus cristatus* grassland**

NVC MG6 grassland is a common community of improved pastures. The sward often has little variety. *Lolium perenne* is usually the most abundant grass and there can be much *Cynosurus cristatus* and *Festuca rubra*. *Holcus lanatus*, *Dactylis glomerata* and *Poa* spp can be frequent. Dicotyledonous associates are *Trifolium repens*, *Cerastium fontanum*, *Plantago lanceolata*, *Ranunculus acris*, *Achillea millefolium* and *Bellis perennis*.

**MG9 *Holcus lanatus-Deschampsia cespitosa* grassland**

The coarse-leaved grasses, *Deschampsia cespitosum*, *Holcus lanatus*, *Dactylis glomerata* and *Arrhenatherum elatius* make up the bulk of the vegetation of this community that usually occurs on permanently damp, poorly-drained or regularly inundated ground. *Deschampsia* and *Holcus* are usually the most abundant. The community is often rather

species-poor. A few sprawlers or tall dicotyledons are able to compete with the large *Deschampsia* tussocks, such as *Lathyrus pratensis*, *Angelica sylvestris* or *Rumex crispus*.

#### **MG10 *Holcus lanatus*-*Juncus effusus*-rush-pasture**

In this community *Juncus effusus* tussocks are scattered within a grassy matrix made up of *Holcus lanatus*, *Agrostis stolonifera*, *Poa trivialis*, *Ranunculus acris* and *Ranunculus repens*. NVC MG10 resembles a species-poor version NVC M23b sub-community, described above. The Typical sub-community, MG10a is grassier and weedier than NVC M23b, and tends to lack that community's common species, such as *Galium palustre* and *Ranunculus flammula*. The community is common in the western pastures belonging to Poldean Farm.

#### **U4 *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland**

NVC U4 is a common community in acid grassland habitat where the underlying soils are less peaty and are more mineral-influenced. The defining characteristic is the presence of the named community grasses, *Festuca ovina* and *Agrostis capillaris*, as well as *Anthoxanthum odoratum* (NVC U4a). Other typical acid grassland species also occur, such as *Nardus stricta*, *Deschampsia flexuosa*, and *Luzula multiflora*. The most common herb associates are *Galium saxatile* and *Potentilla erecta*. *Rumex acetosa* and *Vaccinium myrtillus* can occur and can be frequent but not usually abundant. The most common moss species in general is *Rhytidiadelphus squarrosus* and there can be much *Pseudoscleropodium purum*. Other mosses such as *Pleurozium schreberi*, *Hylocomium splendens*, *R. loreus* and *Hypnum jutlandicum* are found more commonly in specific sub-communities. There are several examples of the *Holcus lanatus*-*Trifolium repens* sub-community U4b in areas where there has likely been some agricultural improvement.

#### **U5 *Nardus stricta*-*Galium saxatile* grassland**

A large proportion of the acid grassland is made up of this community, generally on steepening slopes, near burn sides, or free draining ridges but also on some of the higher ground and ridges where it is often associated with NVC U6 below. The defining characteristic is the dominance or abundance of the grass *Nardus stricta*. Typical associates are *Deschampsia flexuosa*, *Festuca ovina*, *Agrostis vinealis*, and *Anthoxanthum odoratum* and more local *Luzula multiflora*, *Carex binervis*, *C. pilulifera*, *C. panicea*, *Galium saxatile* and *Potentilla erecta*. *Vaccinium myrtillus* can be frequent but not usually abundant. Mosses include *Pleurozium schreberi*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, *R. loreus* and *Hypnum jutlandicum*. NVC U5b sub-community is typical of the higher areas, where species such as *Deschampsia flexuosa*, *Carex nigra* and *Polytrichum commune* are well represented.

At higher altitudes, which often coincide with leveller ridges and plateaux, *Juncus squarrosus* can join the mix and low growing *Vaccinium myrtillus* can increase, sometimes joined by *V. vitis-idaea*. Mosses can include increased *R. loreus* and often *Racomitrium lanuginosum*.

#### **U6 *Juncus squarrosus*-*Festuca ovina* grassland**

U6 grassland is characterised by an abundance of the rush species *Juncus squarrosus*. Graminoid associates include a limited range of common grass species such as *Festuca ovina*, *Deschampsia flexuosa*, *Nardus stricta*, *Agrostis vinealis*, *Agrostis canina* and *Anthoxanthum odoratum* and the wood-rush *Luzula multiflora*. The common herbs *Galium saxatile* and *Potentilla erecta* are usually present and there can be frequent *Vaccinium myrtillus*. The most common communities on sloping areas or where the ground has been subject to draining and heavy grazing are NVC U6c and U6d.

Where the ground is more saturated, on flatter ground and on deep peat, the vegetation is represented by the NVC U6a sub-community, marked by *Eriophorum vaginatum* tussocks and the prominence of bog-mosses such as *Sphagnum capillifolium* and *S. fallax*.

Intergrading vegetation is found between NVC U6 and other grassland communities, as mentioned above. There are also intermediate stands of vegetation between NVC U6 and the various blanket bog and modified bog communities.

#### **U16 *Luzula sylvatica*-*Vaccinium myrtillus* tall herb community**

Several small stands of NVC U16 are scattered through the survey area. The vegetation corresponds to the species-poor NVC U16c sub-community where little else other than *Luzula sylvatica* is easily visible. The community is referred to by target notes since it is always too small to map.

#### **U19 *Oreopteris limbosperma*-*Blechnum spicant* community**

Scattered small patches of NVC U19 occur on various slopes but are too small to map and have only been noted in target notes. *Oreopteris limbosperma*, accompanied in places by *Blechnum spicant* and dryopterid ferns, typically forms a patchy canopy, growing over a bryophyte carpet of pleurocarpous mosses such as *Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus squarrosus*.

#### **U20 *Pteridium aquilinum*-*Galium saxatile* community**

NVC U20 is dominated by *Pteridium aquilinum*. The fern is accompanied by *Anthoxanthum odoratum*, *Festuca ovina*, *Holcus lanatus*, *Galium saxatile*, *Potentilla erecta* and *Rumex acetosa*. The mosses *Rhytidiadelphus squarrosus*, *Pseudoscleropodium purum* and *Hypnum jutlandicum* are common. This community is most frequent and extensive in the western part of the site, on the slopes above Glengap Burn and the Wamphray Water and on the western slopes of Gallatae.

#### **U21 *Cryptogramma crispa*-*Deschampsia flexuosa* community**

*Cryptogramma crispa* is the most abundant plant in NVC U21. There can be some *Deschampsia flexuosa*, *Festuca ovina*, *F. vivipara*, *Nardus stricta*, *Agrostis capillaris* and *Anthoxanthum odoratum*. *Galium saxatile* and various bryophytes (*Andraea rupestris*, *Racomitrium* spp) and lichens can form sheets over the stones. Scree habitat within the site is confined to a very few areas and at one of these locations *Cryptogramma* is present, giving vegetation that is roughly approximate to NVC U21.

#### **S9 *Carex rostrata* swamp**

One small area of this community is found at Combe Rig beside Cogie at the proposed western entrance to the site. It is referable to the S9a sub-community, being dominated by *Carex rostrata*. The community grades into NVC M23 mire at the drier margins.

#### ***Juncus effusus* acid grassland community**

On the north east slopes of Corse Law there is vegetation with tussocks of *Juncus effusus* amongst acid grassland typical of U4/U5 grassland. This is similar to that described by Averis et al in 'An Illustrated Guide to British Upland Vegetation' as a form of species-poor vegetation consisting of large tussocks of *Juncus effusus* beneath which there is a sward of typical acid grassland species including *Agrostis capillaris*, *Festuca ovina*, *Anthoxanthum odoratum*, *Nardus stricta*, *Galium saxatile*, *Potentilla erecta* and the moss *Rhytidiadelphus squarrosus*.

Similar vegetation is found with *Juncus acutiflorus* replacing *Juncus effusus* in the same area.

**Appendix 8.9 – Phase 1 Target Notes Description****Habitats of significance highlighted in green****Target notes for south-eastern forest area including Silton Forest**

1	317748	594479	Extensive formerly improved grassland below track with much <i>Urtica dioica</i> .
2	317921	594573	Below track narrow valley with ash and hazel woodland; upstream with complex (hard to map) open mosaic of blocks of new plantation (broad-leaved), acid grassland, bracken, flushes and some stands of nettle.
3	318055	594999	Valley mosaics of acid or wet grassland and bracken mosaic, with local new plantation blocks (over <i>Ranunculus repens</i> and <i>Urtica dioica</i> ).
4	317318	594993	Steep east side valley side with bracken and heath; downstream dense scrub dominates (hawthorn with hazel) – hard to access. West bank with more open pine plantation (much fern).
5	317362	595224	Level grassy area by burn with frequent bracken and <i>Luzula sylvatica</i> , local diverse; herbs include <i>Pimpinella saxifraga</i> and <i>Cirsium helenoides</i> , and to burn edge some <i>Cochlearia</i> sp. Bracken and dry heath on steep east bank slope.
6	317320	595602	Several steep sided valleys meet, with heather or <i>Luzula sylvatica</i> on steeper part, otherwise bracken and acid grassland, and some flushes ( <i>Molinia</i> or <i>Juncus</i> ); also, some patchy scrub.
7	317291	595671	Small feeder valley with central <i>Juncus acutiflorus</i> flush (Some <i>Chrysosplenium oppositifolium</i> , <i>Stellaria alsine</i> ), and to sides brackens or wet grassland.
8	316990	595508	East bank with heath above but below some marshy grassland with some <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> stands, and quite diverse with <i>Carex flacca</i> , <i>Ajuga reptans</i> , <i>Angelica sylvestris</i> , <i>Succisa pratensis</i> , <i>Centaurea nigra</i> and <i>Cirsium helenoides</i> ; <i>Luzula sylvatica</i> and ferns to narrow west bank below larch plantation.
9	316911	595714	Steep embankment with heather and blaeberry (occasional <i>Luzula sylvatica</i> ); ferns and heather to the short west bank above water.
10	316904	595820	Dry heath across steep embankment; here local stand of hawthorn scrub (some <i>Primula vulgaris</i> , <i>Oxalis acetosella</i> , <i>Viola riviniana</i> and ferns include <i>Oreopteris limbosperma</i> ).
11	316915	595805	Small valley with dense stand of <i>Luzula sylvatica</i> , plus patches of <i>Cirsium helenoides</i> .
12	316825	595903	Steep bank down to burn with acid grassland locally much bracken (on slope and leveller areas by burn); west bank with short embankment with heather and ferns.
13	316826	595944	Steep crescent bank clothed with heather and blaeberry plus ferns; bracken becomes dense upstream; steep west bank (below conifers) with dense willow scrub plus ferns and stands of bracken (mostly above).
14	317057	596400	West bank with short slope supporting bracken or locally heather; east bank with much <i>Filipendula ulmaria</i> with some wet grassland ( <i>Deschampsia cespitosa</i> ).
15	317186	596643	Large <i>Filipendula</i> dominated marsh with <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Chrysosplenium oppositifolium</i> , <i>Juncus acutiflorus</i> , <i>Stellaria alsine</i> plus <i>Cochlearia officinalis</i> , <i>Cirsium helenoides</i> and <i>Carex lasiocarpa</i> .
16	317210	596701	North of bridge broad valley with large stand of <i>Filipendula ulmaria</i> marsh ( <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Juncus acutiflorus</i> ) with further north areas of wet grassland; steeper west bank with acid grass and large patch of willow scrub (steep, flushed).

17	317038	596718	Valley recently felled, with steep southern bank with stands of heather and <i>Luzula sylvatica</i> (locally with <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> above, linked to relic or recovering bog fringe) – some broad-leaved planting; north bank with acid grass, but local bracken patches (and some rosebay willowherb).
18	316728	596767	Southern edge with relic bog with <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , and rare <i>Vaccinium vitis-idaea</i> ; below mosaic of heath, bracken and <i>Filipendula</i> marsh – recently felled here.
19	316409	596852	Wet <i>Juncus</i> or <i>Molinia</i> mires to burn sides or side flushes; some steeper banks with patches of heather.
20	316357	596815	Ride with relic bog vegetation between felled plantations; heather with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> and pleurocarp mosses.
21	316264	596737	Very tussocky bog in previously felled area but replanted with broad-leaves and some sitka spruce regeneration.
22	317956	596810	Broad ride glade, <i>Molinia</i> dominated but here frequent <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> .
23	317840	596496	Deep new drain (fed by older ones) with increasing <i>Molinia</i> and some <i>Juncus effusus</i> (drains and flushes) local <i>Eriophorum vaginatum</i> relics.
24	317846	596427	Broad strip of disturbed bog with deep drains (some recently cleared) and old <i>Calluna</i> dominated ridges to outer edges; recovering bog vegetation with <i>Eriophorum</i> and <i>Calluna</i> plus mosses, <i>Juncus effusus</i> and <i>Agrostis canina</i> and occasional willow colonist. <i>Molinia</i> increases to the east.
25	317928	596437	<i>Molinia</i> increases further east, but still much <i>Eriophorum vaginatum</i> but less ericoids and bog elements (mostly pleurocarp mosses).
26	317947	596394	Lower lying graminoid bog vegetation with both <i>Eriophorum</i> and <i>Molinia</i> .
27	317991	596368	Bog elements extend east with some <i>Trichophorum</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> and <i>Sphagnum</i> .
28	317985	596283	Diverse bog with much <i>Calluna vulgaris</i> with <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium oxycoccos</i> , with <i>Sphagnum rubellum/capillifolium</i> and some <i>S. papillosum</i> .
29	318070	596076	Central valley with <i>Juncus effusus</i> plus <i>Ranunculus repens</i> , <i>Cirsium palustre</i> , <i>Stellaria alsine</i> and <i>Viola palustris</i> ; <i>Molinia</i> dominated mire to both sides.
30	318080	595970	Uneven, sloping bog margin with tussocky <i>Molinia</i> domination; occasional bog element ( <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> ) with <i>Vaccinium myrtillus</i> and <i>Galium saxatile</i> ; moss frequent with occasional <i>Sphagnum rubellum</i> , <i>S. palustre</i> and <i>Rhytidiadelphus loreus</i> .
31	318124	595894	Local <i>Juncus effusus</i> flushes (with <i>Rumex acetosa</i> , <i>Angelica sylvestris</i> , <i>Cardamine pratensis</i> and <i>Cirsium palustre</i> ), through <i>Molinia</i> mire margin and local bracken stands on steeper banks.
32	318256	595675	Mosaic of acid grass with bracken and some <i>Luzula sylvatica</i> ; wetter below with <i>Juncus</i> marsh (and <i>Molinia</i> above); patchy scrub with eared willow.
33	318393	595565	Scrubby valley, difficult to map or code: steep sides with acid grass (some wet and flushed) with scrub and new planting; below wet grassland ( <i>Holcus</i> – <i>Deschampsia</i> ) with <i>Juncus</i> and <i>Filipendula</i> ; above, the forest edge with tussocky <i>Molinia</i> .
34	318411	595490	Drain with some <i>Eleocharis palustris</i> and <i>Typha latifolia</i> .
35	318477	595548	Both sides of the old track with marshy grassland (mosaics or intermediate <i>Juncus effusus</i> , <i>Deschampsia cespitosa</i> and <i>Molinia caerulea</i> ).
36	318574	595502	Low hill to the south of the track with much <i>Juncus effusus</i> but also spaced young trees; below to the burn marshy grassland with <i>Filipendula ulmaria</i> and <i>Deschampsia cespitosa</i> , with occasional bracken (scattered or dense).



37	318556	595335	Upper valley with stands of bracken and marshy Filipendula ulmaria (and coarse grassland), with below increasing scrub woodland (ash, hazel, willow, hawthorn and blackthorn) – some above presumably planted.
38	318790	595540	Large hollow (below track embankment with Filipendula ulmaria extending down to the burn, but above is a patch of Carex acutiformis).
39	318888	595429	Upper valley with complex mosaic of vegetation difficult to map accurately; steeper slopes with acid grassland plus some bracken or flushed (Juncus or Filipendula); burn sides with stands of Filipendula ulmaria, local bracken and wet grassland (Deschampsia cespitosa and Holcus); also, local scrub with some plantation blocks.
40	319133	595195	Track sides with stands of rosebay willowherb or Juncus acutiflorus, or wet acid grassland; plus, blocks of planted trees.
41	319809	594257	Local ridge of bracken but otherwise past enriched but ungrazed grassland (much Holcus with Ranunculus repens plus local Cirsium arvense, Urtica dioica and Juncus effusus).
42	319768	594362	Small valley with Molina dominated mire: to west side more Juncus effusus, but to the east boggy relics with Eriophorum vaginatum, Polytrichum commune, Erica tetralix, Calluna vulgaris, Dryopteris carthusiana, Vaccinium oxycoccos and Sphagnum rubellum and S. fallax.
42	319726	594363	North side of small valley with local rock outcrop supporting Teucrium, Vaccinium myrtillus, Polypodium vulgare, Erica cinerea, Hieracium sp, and occasional Thymus; marsh strip below with Juncus acutiflorus (then Molinia).
44	319708	594374	Parallel small valley with similar Molinia plus occasional Eriophorum vaginatum; some Sphagnum capillifolium and Polytrichum strictum hummocks, one with Vaccinium oxycoccos.
45	319935	594459	Burn sides with marshy grassland to flushed or wetter sides, but some acid grass where steeper; Molinia occurring above to plantation edges. Several blocks of planted, or regenerating, stunted trees (ash frequent).
46	319935	594481	Filipendula ulmaria dominates with Angelica, Geum rivale and some Juncus acutiflorus.
47	319959	594558	Steepening bog margin (down to edge above burn), dominated by Molinia with few ericoids but more Hylocomium splendens, Pleurozium schreberi and Galium saxatile (old drain).
48	320012	594612	Extensive tussocky bog on gentle slope, occasional to frequent spruce colonists; Molinia is abundant but locally much Eriophorum vaginatum and Calluna vulgaris, plus Vaccinium myrtillus, Erica tetralix, rare No, Empetrum nigrum, with Polytrichum commune, Pleurozium schreberi, Aulacomnium palustre, Sphagnum palustre, S. capillifolium, and occasional hummocks with Polytrichum strictum and Cladonia spp.
49	320050	594677	Wetter bog here (little Molinia) with Eriophorum vaginatum and large hummocks, and some Vaccinium oxycoccos.
50	320030	594698	Molinia dominates central strip and all the way up gentle slope to the wall.
51	320079	594771	Molinia dominated with some old peat edges and occasional drain or lower-lying flush (occasional Eriophorum vaginatum).
52	319945	594739	Very wet mire area (fed by drains from plantation spur) with much Sphagnum plus Eriophorum vaginatum and Molinia caerulea.
53	319897	594774	Long triangular spur between plantations on gentle slope with modified bog; dominated by Molinia but locally prominent Calluna and other bog relics.
54	319728	594871	Level ground to broad burn channel between conifers; east side with much Molinia (old bog edges) but to the west a mosaic of Juncus acutiflorus marsh with some wet acid grass (local Molinia patches); some scrubby trees – ash, hazel, hawthorn (probably planted).

55	320445	594574	Old ride with gravelly track bed covered by moss (some lichens), herbs and sitka seedlings plus wet grassland and rushes; herbs include Trifolium spp., Prunella vulgaris and some Linum catharticum.
56	320190	595794	Wedge shaped area of former (possibly open) plantation (some brash and logs) with tussocky relic (or recovering) bog; Molinia and Eriophorum vaginatum common with Calluna vulgaris, Erica tetralix, Vaccinium myrtillus, Deschampsia flexuosa, Galium saxatile plus Pleurozium schreberi, Sphagnum capillifolium and Polytrichum strictum; Eriophorum vaginatum commoner to wetter centre.
57	319945	595883	Very small pool to track edge (some Callitriche stagnalis) with boggy relic to plantation edge; track itself gravelly with moss and sitka seedlings (and wet grass, Deschampsia cespitosa etc).
58	319901	595926	Wetter hollow with some open water and floating mats of Sphagnum with Eriophorum vaginatum and Carex rostrata (NVC M2b-M4).
59	319883	595947	Felled area with recovering bog; much Eriophorum vaginatum and Calluna vulgaris with some Erica tetralix and Vaccinium myrtillus, and mosses such as Sphagnum rubellum, S. fallax, Polytrichum commune, Pleurozium schreberi, Polytrichum strictum, Rhytidiadelphus loreus and occasional Cladonia.
60	319800	595894	Broad level area of disturbed bog, very tussocky, with cover of Calluna vulgaris and Eriophorum vaginatum; margins with felled trees and much young growth (regeneration or planted); associates include Vaccinium myrtillus, Deschampsia flexuosa, Erica tetralix and rare Molinia, Trichophorum, Eriophorum angustifolium and Empetrum nigrum; mosses include Hypnum jutlandicum, Polytrichum commune, Sphagnum capillifolium, Pleurozium schreberi and local Cladonia (C. impexa, C. arbuscula).
61	319708	595806	Old wall, lichen encrusted, topped with Cladonia lichens, moss and heather.
62	319665	595732	Wetter bog to the north of the wall but also much sitka spruce regeneration (possibly planting), and appearing wet heath-like: Trichophorum germanicum common with Narthecium ossifragum, Erica tetralix, both Calluna vulgaris and Eriophorum vaginatum locally scarce, and some Vaccinium oxycoccos, Empetrum nigrum; bryophytes include Sphagnum tenellum, local S. papillosum and S. cuspidatum, S. rubellum, Hypnum jutlandicum and often frequent Cladonia spp.
63	319677	595672	Strip of Molinia dominated vegetation separating further block of similar Trichophorum dominated bog (wet heath).
64	319592	595639	Steep sloping rand (Molinia dominated) to the marshy low-lying area by the burn, where stands of Juncus acutiflorus (locally with Sphagnum closer to the Molinia/peat edge); associates nearer burn include Filipendula ulmaria, Deschampsia cespitosa, Ranunculus repens, Galium palustre, Stellaria alsine, Cirsium palustre and Valeriana dioica.
65	319515	595803	Broad Molinia rand (c. 3m drop down to burn) with some ericoids; western side with wet Deschampsia–Holcus grassland plus Juncus acutiflorus.
66	319536	595941	Level area of tussocky Molinia dominated modified bog, with abundant sitka regeneration (1 to 3m tall); locally quite diverse with Erica tetralix, Eriophorum vaginatum, Calluna vulgaris plus Trichophorum germanicum, Narthecium ossifragum, Empetrum nigrum and Vaccinium oxycoccos, Sphagnum mostly S. capillifolium (or rubellum) with rare S. cuspidatum and S. papillosum, plus Hypnum jutlandicum and Pleurozium schreberi.
67	319538	595987	Slope with increased dominance of Molinia caerulea.
68	319422	596060	Marshy area about burn, locally diverse, with Filipendula ulmaria, Geum rivale, Ajuga reptans, Succisa pratensis, Valeriana dioica, Juncus acutiflorus and Carex spp. (C. echinata, C. hostiana, and possibly C. lasiocarpa).

69	319386	596047	Burn sides with abundant wet marsh (much <i>Filipendula ulmaria</i> and <i>Juncus acutiflorus</i> – rare <i>Carex rostrata</i> ); above to the plantation edges are narrow to broad strips of <i>Molinia</i> (degraded bog).
70	319129	595984	Plantation ride with wet grassland: much <i>Holcus lanatus</i> , <i>Deschampsia cespitosa</i> and <i>Juncus effusus</i> , with occasional <i>Molinia</i> relic.
71	319129	596015	Broad ride with here much <i>Molinia</i> with some <i>Eriophorum vaginatum</i> ; further north wet grassland predominates with frequent <i>Juncus effusus</i> .
72	318930	595851	Small stand of <i>Carex rostrata</i> in wetter hollow (some <i>Galium uliginosum</i> ).
73	318921	595915	Shallow burn valley with above, to the plantation edges, stands of <i>Molinia</i> ; nearer the burn low-lying areas with mosaic of marsh ( <i>Juncus acutiflorus</i> or <i>Filipendula ulmaria</i> ) with local areas of wet grassland ( <i>Deschampsia cespitosa</i> , <i>Holcus lanatus</i> ). Local patches of ash (planted).
74	318830	596066	Confluence of various small valleys and rides (drains) with mostly <i>Juncus acutiflorus</i> dominated marsh with wet grassland and several blocks of new broad-leaves (most stunted and in poor condition). Feeders upstream with similar marshy conditions with <i>Juncus</i> but also more <i>Molinia</i> mire (not visited far upstream).
75	318869	596191	Open valley with level marshy vegetation: much <i>Juncus acutiflorus</i> with local <i>Molinia caerulea</i> and <i>Deschampsia cespitosa</i> , plus <i>Rumex acetosa</i> , <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> , <i>Viola palustris</i> and mosses.
76	319355	596569	Broad valley with diverse marshy vegetation, locally diverse herbs, and some <i>Sphagnum</i> zones (M6d).
77	319358	596617	Small patch (sparse and stunted) of <i>Phragmites</i> .
78	319297	596670	Broad marshy channel with a fen type vegetation (lagg) with <i>Juncus acutiflorus</i> plus local <i>Filipendula ulmaria</i> (west side – and outflow drain), <i>Molinia caerulea</i> (bog side), <i>Carex rostrata</i> , <i>C. lasiocarpa</i> , <i>Caltha palustris</i> , <i>Comarum palustre</i> , <i>Ajuga reptans</i> , <i>Succisa pratensis</i> , <i>Valeriana dioica</i> and mosses include some <i>Sphagnum teres</i> .
79	319322	596696	Local area with increased <i>Trichophorum germanicum</i> and <i>Erica tetralix</i> , <i>Calluna vulgaris</i> and some <i>Sphagnum tenellum</i> (wet heath affinities).
80	319378	596680	Bog on gentle slope with much <i>Trichophorum germanicum</i> and <i>Erica tetralix</i> (plus <i>Calluna</i> , <i>Eriophorum</i> , <i>Empetrum</i> , <i>Molinia</i> ) but limited <i>Sphagnum</i> – affinities to wet heath (M15).
81	319417	596683	Leveller bog near to wall (some sitka) with <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> , plus much <i>Sphagnum</i> and <i>Vaccinium oxycoccos</i> .
82	319388	596746	Bog with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Calluna vulgaris</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum capillifolium</i> , <i>S. palustre</i> , <i>S. papillosum</i> and <i>Polytrichum strictum</i> .
83	319358	596798	<i>Molinia</i> dominates but initially with wet mire associates (not bog).
84	319394	596975	<i>Filipendula</i> dominated fen with <i>Ajuga reptans</i> , <i>Juncus acutiflorus</i> , <i>Angelica sylvestris</i> and <i>Valeriana dioica</i> ; <i>Filipendula</i> extends down drain line.
85	319207	597273	Very tussocky and uneven wedge of <i>Eriophorum vaginatum</i> bog with <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> .
86	319103	597328	Wet tussocky <i>Eriophorum vaginatum</i> to margin with much moss ( <i>Pleurozium schreberi</i> , <i>Sphagnum palustre</i> , <i>S. fallax</i> ), <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> and <i>Carex nigra</i> .
87	319123	597351	Ridge near wall with acid grassland (much <i>Holcus</i> ) with <i>Juncus effusus</i> flushes below (feeding bog).
88	318986	597270	Central flush of wet <i>Eriophorum vaginatum</i> with <i>Erica tetralix</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.

89	318965	597240	Level area of tussocky bog with abundant <i>Calluna vulgaris</i> plus <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , rare <i>S. papillosum</i> and <i>Aulacomnium palustre</i> . Several sitka colonists.
90	318958	597221	Flush of wet <i>Eriophorum vaginatum</i> (little <i>Calluna</i> ) with <i>Sphagnum fallax</i> .
91	318935	597095	Relic bog spilling down from bog above with <i>Eriophorum vaginatum</i> but also <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum palustre</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
92	318890	597148	Bog strip between ridge with abundant <i>Calluna vulgaris</i> plus <i>Eriophorum vaginatum</i> , with <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> , <i>Sphagnum capillifolium</i> , <i>S. palustre</i> plus some <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Vaccinium oxycoccos</i> .
93	318881	597120	Bog strip becoming graminoid with very tussocky <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> and between local <i>Sphagnum palustre</i> .
94	318878	597099	Peat edges with some <i>Eriophorum vaginatum</i> below extending down towards plantation.
95	318814	597148	Ridge of acid grassland with wet <i>Holcus</i> grassland and <i>Juncus effusus</i> on slopes; <i>Molinia</i> below and then grades to <i>Eriophorum vaginatum</i> bog edges.
96	318721	597161	Disturbed rectangular hollow with acid grass.
97	318641	597160	<i>Juncus effusus</i> patch with <i>Rumex acetosa</i> , <i>Cardamine pratensis</i> , <i>Cirsium palustre</i> , <i>Galium saxatile</i> and <i>Rhytidiadelphus squarrosus</i> .
98	318629	597181	<i>Molinia</i> and <i>Eriophorum vaginatum</i> modified bog with <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Rumex acetosa</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
99	318513	597124	Narrowing bog margin with <i>Molinia</i> and <i>Eriophorum vaginatum</i> plus <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Agrostis vinealis</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
100	318948	597419	Small ridge with acid grassland (some <i>Carex binervis</i> ) with local <i>Vaccinium myrtillus</i> heath; <i>Luzula sylvatica</i> stand near wall below.
101	318757	597459	<i>Calluna</i> dominates up the slope with much <i>Sphagnum capillifolium</i> plus <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> and much <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> and <i>Hypnum jutlandicum</i> .
102	318830	597591	<i>Juncus effusus</i> mire, with much <i>Sphagnum</i> about drains and flushes to both burn sides, and down burn valley but here more mineral-enriched.
103	318839	597619	Tussocky drained bog on sloping but uneven ground; locally with much <i>Calluna vulgaris</i> , plus <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , with large moss hummocks containing <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>R. squarrosus</i> , <i>Sphagnum capillifolium</i> .
104	318419	597971	Leveller ground with increased <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; rises beyond with <i>Molinia caerulea</i> abundant.
105	318298	598266	Small patch of <i>Luzula sylvatica</i> by fence, but otherwise bog extensive but with some local patches of wet <i>Molinia caerulea</i> .
106	318192	598445	Broad peaty ride to both sides of fence between conifer block (northern side over relic bog); <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Vaccinium myrtillus</i> , rare <i>V. oxycoccos</i> , <i>Empetrum nigrum</i> , <i>Erica tetralix</i> , local <i>Molinia caerulea</i> (some patches), <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
107	318020	598827	Narrow valley with some <i>Molinia</i> immediately below, but then flushed acid grassland with <i>Juncus effusus</i> ; further below more acid grassland and bracken



			patches.
108	318091	597692	Shallow burn crosses track between young plantations; marshy above ( <i>Juncus effusus</i> but some <i>Molinia</i> zones) but below much bracken and flushed grassland.
109	317301	597389	Steep bank with some patches of heath (mainly blaeberry); burn sides below with various herbs and acid to neutral grassland, and central flushes with much <i>Filipendula</i> marsh but most recently planted with broad-leaves.
110	317276	597530	Steep western bank with patches of heather ( <i>Molinia</i> above – but also new planting); below new planting in <i>Filipendula</i> marsh and increasing scrub (some purple osier); locally diverse grass with <i>Luzula sylvatica</i> , <i>Centaurea nigra</i> , <i>Geum rivale</i> , <i>Filipendula ulmaria</i> and ferns.
111	316400	597070	Western bank with steep bracken zones but much with new broad-leaved planting; latter spreads up hillside over recovering bog vegetation (all way to track?). Easter side with patches of acid grassland, bracken, heath or <i>Molinia</i> .
112	316428	597289	Valley floor with large <i>Filipendula</i> stand plus <i>Juncus acutiflorus</i> flushes; <i>Molinia</i> frequent up the eastern side (some heather), west with narrow acid grass but above new broad-leaved plantation over bog (but recently felled conifers).
113	316513	598057	Large marshy vegetation by the burn with <i>Juncus acutiflorus</i> plus <i>Angelica sylvestris</i> , <i>Ranunculus repens</i> , <i>Cardamine pratensis</i> , <i>Ajuga reptans</i> , <i>Stellaria alsine</i> and <i>Cochlearia officinalis</i> ; marshy vegetation extends down valley but with <i>Molinia</i> on slopes above.
114	316221	598182	Wet acid grassland by open burn sides with patches of <i>Juncus</i> or <i>Filipendula</i> marsh along leveller sides.
115	316111	598171	Small valley with large flushes of <i>Filipendula ulmaria</i> and acid grassland; south side with much heather on slope but <i>Molinia</i> above
116	315725	598530	Valley with steep sides, north side with much heather and some large erosion slips – and further down bracken, otherwise acid grassland; above to south side strip of tussocky bog vegetation.
117	315870	598626	Small pool with <i>Potamogeton natans</i> and <i>P. berchtoldii</i> .
118	316691	599006	Valley below (not visited) with mosaic of acid grassland and large bracken zones plus scattered scrub.
119	316623	599190	Narrow bank of <i>Molinia</i> (with local heath stands) by small burn; above (over track) dense stand of willow scrub.
120	317097	599095	Bank above track (not planted) with relic heath plus occasional <i>Molinia caerulea</i> and <i>Luzula sylvatica</i> , plus bracken stands.
121	317319	599309	Broad valley with frequent new planting in mosaic with marshy patches ( <i>Filipendula</i> ), wet grassland ( <i>Deschampsia cespitosa</i> ) and rosebay willowherb, plus local willow scrub and steeper banks with more acidic grassland.
122	317124	599466	Small feeder with new planting but some areas of bracken and acid grassland, plus local <i>Molinia</i> above.
123	316858	599939	South bank of burn with steep sides supporting bracken here, but upstream heather dominates; burn sides with wet grassland and marsh.
124	317243	599512	Large stands of wet <i>Filipendula ulmaria</i> marsh (with <i>Geum rivale</i> , <i>Chrysosplenium oppositifolium</i> ) and wet grassland ( <i>Deschampsia cespitosa</i> with spreading raspberry).
125	317096	599736	Broad levellish valley (some old walls), poorly draining with extensive new broad-leaved planting (some conifer blocks to west side); east side with some steeper banks with heather and bracken stands.
126	317036	599972	Bothy area with amenity grass plus stands of <i>Urtica dioica</i> , <i>Chamerion angustifolium</i> and <i>Spiraea</i> sp.

127	317050	600051	Burnside acid to neutral grassland but locally herb rich and variable (some <i>Deschampsia cespitosa</i> and local <i>Calluna vulgaris</i> ); associates include <i>Carex flacca</i> , <i>Succisa pratensis</i> , <i>Potentilla erecta</i> , <i>Centaurea nigra</i> , <i>Galium verum</i> , <i>Achillea millefolium</i> and <i>Dactylorhiza</i> sp. East bank with conifers and scrub.
128	317421	600981	Ride down steep slope with flushed grassland and above <i>Luzula sylvatica</i> and <i>Chamerion angustifolium</i> .
129	317440	600979	Broad marshy area below old dyke, with much <i>Filipendula ulmaria</i> plus <i>Ranunculus repens</i> , <i>Cirsium palustre</i> , <i>Angelica sylvestris</i> , <i>Viola palustris</i> , <i>Valeriana dioica</i> and <i>Ajuga reptans</i> .
130	317518	601025	Broad valley with stands of <i>Juncus</i> or <i>Filipendula</i> to burn and feeder flushes (rare <i>Luzula sylvatica</i> ), with much new broad-leaved planting to east bank, and less so to east.
131	317535	600935	Broad valley with mosaic of wet acid grassland plus <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> to burn and some larger flushed zones; much new broad-leaves planting to east bank.
132	315959	600097	Broad slope between plantations with a wet heath cover (more <i>Molinia</i> below, but drier above); occasional <i>Juncus</i> or <i>Deschampsia cespitosa</i> flushes.

#### Target notes for north western area including Dundoran Plantation, Broadfield Height and Craig Fell

1	313057	598436	Strip of wet heath and mire above burn ( <i>Sphagnum denticulatum</i> , <i>Carex echinata</i> , <i>Molinia caerulea</i> and some ericoids).
2	313053	598460	Heavily drained mire ( <i>Juncus acutiflorus</i> with some <i>Molinia</i> to centre)
3	313031	598490	Drained mire with some wet heath elements ( <i>Calluna</i> , <i>Molinia</i> , <i>Juncus squarrosus</i> , <i>Carex</i> spp., and some <i>Sphagnum</i> ).
4	313010	598521	Relic areas of acid grass with wet heath (short grazed <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> and some <i>Sphagnum capillifolium</i> ).
5	313023	598582	Large stony erosion spill below small valley, meets drained mire.
6	312935	598691	Locally increased <i>Molinia caerulea</i> , and some <i>Juncus squarrosus</i> , but still much <i>Juncus acutiflorus</i> with other wet acid grass former bog relics (frequent moss).
7	312901	598753	Intermediate wet acid grassland with <i>Juncus acutiflorus</i> zones in heavily (recently) drained mire; some <i>Sphagnum</i> and <i>Carex echinata</i> but not appearing peaty (drain exposure mineral).
8	313084	598844	Peaty wet acid grassland extends down slope with <i>Juncus squarrosus</i> , <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Calluna vulgaris</i> (short), <i>Polytrichum commune</i> and pleurocarp mosses.
9	313381	598694	<i>Juncus squarrosus</i> locally dominant to summit acid grassland with <i>Nardus stricta</i> , <i>Anthoxanthum odoratum</i> , <i>Carex nigra</i> , short <i>Vaccinium myrtillus</i> , <i>Potentilla erecta</i> , <i>Pleurozium schreberi</i> and <i>Rhytidadelphus squarrosus</i> .
10	313327	598874	Strip of <i>Juncus squarrosus</i> dominated acid grassland but here with some <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> (peat c. 25cm) plus short <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Carex nigra</i> .
11	313280	598923	Wet depression with heavily drained bog relic: much <i>Sphagnum fallax</i> plus <i>S. papillosum</i> and <i>S. rubellum</i> , plus <i>Aulacomnium palustre</i> , <i>Eriophorum vaginatum</i> e. <i>angustifolium</i> , <i>Trichophorum germanicum</i> and <i>Carex nigra</i> .
12	313087	598964	Slope with more distinctly (than area to south) boggy relics with common <i>Eriophorum vaginatum</i> tussocks plus some short <i>Vaccinium myrtillus</i> and <i>Calluna vulgaris</i> , with frequent <i>Sphagnum</i> (locally much) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> and <i>Pleurozium schreberi</i> .
13	313054	599054	Short pasture (and bracken) extends up steep burn sides; occasional fern, foxglove,

			<i>Viola riviniana</i> , <i>Oxalis acetosella</i> and some heather to rock face.
14	312928	599066	Erosion gully and block of <i>Juncus effusus</i> .
15	312615	598993	Ride through forest dominated by <i>Vaccinium myrtillus</i> (aerial photos indicate normally more heather).
16	312661	599034	Level summit area with some relic bog vegetation, including much <i>Sphagnum</i> : <i>Eriophorum vaginatum</i> with <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and some <i>Vaccinium vitis-idaea</i> .
17	312706	599115	Flushed slope with some flushed <i>Nardus</i> grassland, with diverse low-growing species: <i>Carex panicea</i> , <i>Succisa pratensis</i> , <i>Carex hostiana</i> , <i>Pedicularis sylvatica</i> and some <i>Anemone nemorosa</i> .
18	312701	599169	Acid grassland above but with much <i>Trichophorum germanicum</i> plus some short <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> (wet heath affinities); bryophytes include rare <i>Leucobryum glaucum</i> .
19	312684	599196	Increased, but short grazed, wet heath elements on slope above flushes (frequent <i>Trichophorum germanicum</i> and short <i>Calluna vulgaris</i> ).
20	312699	599230	Flushed hill slope locally very herb rich with <i>Carex</i> spp. <i>Succisa pratensis</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> and bryophytes include <i>Climacium dendroides</i> and <i>Rhytidiadelphus triquetrus</i> .
21	312664	599206	Slope with increased wet heath or bog relics with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> and <i>Sphagnum</i> (but peat shallow); grass dominated surrounding area about with often much <i>Trichophorum</i> .
22	312614	599182	Small patch of relic bog (dry) with <i>Eriophorum vaginatum</i> but some <i>Sphagnum</i> .
23	312604	599227	Small depression with heavily drained wet bog; much <i>Sphagnum papillosum</i> plus <i>Eriophorum vaginatum</i> and some <i>Vaccinium oxycoccos</i> ; peat c. 50cm deep.
24	312536	599144	Extensive upper slope of field supporting bent-fescue pasture (not as appearing on recent aerial images), locally with scattered, but increasing bracken; species limited but some <i>Poa humilis</i> , <i>Potentilla erecta</i> , <i>Conopodium majus</i> and <i>Veronica chamaedrys</i> . More diversity in wet flushes below
25	312505	599443	Herb rich flushes with <i>Ajuga reptans</i> , <i>Cardamine pratensis</i> , <i>Filipendula ulmaria</i> , <i>Lysimachia nemorum</i> , <i>Geum rivale</i> , <i>Ficaria verna</i> , <i>Galium palustre</i> and rare sedge <i>Carex laevigata</i> (some <i>Potentilla sterilis</i> , <i>Viola riviniana</i> and <i>Primula vulgaris</i> ).
26	312700	599411	Further up valley mire is very intermediate transition state from bog above to more distinctly <i>Juncus</i> dominated mire below; <i>Juncus squarrosus</i> and <i>Eriophorum vaginatum</i> both scarce as is <i>Sphagnum</i> .
27	312742	599349	Broad valley mire but very heavily drained with few bog elements surviving (some cells of <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> , <i>Juncus squarrosus</i> and <i>Molinia caerulea</i> ) though with much wet acid grassland as well dense to invasive <i>Juncus acutiflorus</i> ; locally diverse herbs in mineral flushes with <i>Succisa pratensis</i> , <i>Ajuga reptans</i> , <i>Lysimachia nemorum</i> , <i>Carex</i> spp and <i>Pedicularis sylvatica</i> .
28	312855	599289	Plantation with block (or scattered) pines with much bracken or local <i>Juncus effusus</i> (and pasture).
29	312822	599162	Heavily drained mire in valley bottom (drains very recent) with much <i>Juncus acutiflorus</i> , some in dominant flush zones but much intermediate with flushed acid grassland elements (difficult to code or classify); several of marshy species from flushes up slope to west occur here.
30	312648	599623	Tussocky bog on leveller ground with quite dense cover of <i>Sphagnum</i> (mainly <i>S. fallax</i> and <i>S. capillifolium</i> ).
31	312869	599793	Wetter bog with much <i>Sphagnum</i> (much <i>S. fallax</i> ) with <i>Polytrichum commune</i> ; drying as rises to wall corner.
32	312989	599577	Deeply drained relic with abundant <i>Sphagnum</i> (much <i>S. papillosum</i> ) plus

			<i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Narthecium ossifragum</i> .
33	313021	599437	Small patch of short pasture with much <i>Juncus effusus</i> but otherwise mostly wet acid grassland <i>Juncus squarrosus</i> and mosses plus <i>Agrostis canina</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> etc. (and <i>Eriophorum vaginatum</i> bog to north)
34	313147	599324	Leveller ground above with wetter bog, locally thick <i>Sphagnum</i> carpet (much <i>S. fallax</i> ) and <i>Polytrichum commune</i> and <i>Juncus squarrosus</i> ; tussocky <i>Eriophorum vaginatum</i> (with <i>Vaccinium myrtillus</i> and <i>Pleurozium schreberii</i> ) but only occasional short <i>Calluna vulgaris</i> .
35	313201	599202	Broad shallow valley with drained bog now dominated by rather species poor <i>Juncus acutiflorus</i> ( <i>Cirsium palustre</i> , <i>Rumex acetosa</i> and <i>Viola palustris</i> ) and some wet acid grassland elements (but few bog species).
36	313319	599041	Low-lying area with bog pool-type cover with much <i>Sphagnum papillosum</i> plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Vaccinium oxycoccos</i> and <i>Drosera rotundifolia</i> .
37	313621	598796	Bracken becoming very dense.
38	313653	598796	Small open areas of pasture or <i>Juncus acutiflorus</i> but otherwise dense bracken.
39	313649	598850	Steep-sided burn with some ferns and pasture, plus more or less continuous line of scrub wood (rowan with willow).
40	313726	598829	Local patches of acid grass some with short grazed heath relics.
41	313551	598989	Lower slope with increased <i>Eriophorum vaginatum</i> relics and locally frequent <i>Sphagnum</i> plus some <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> (wet heath affinities).
42	313464	599158	Long strip of wet bog mire below two embankments; much <i>Sphagnum fallax</i> plus <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> and <i>Carex nigra</i> .
43	313363	599156	Local block of mire with more prominent <i>Eriophorum vaginatum</i> and some <i>Sphagnum</i> ; grades to <i>Juncus squarrosus</i> acid grassland.
44	313719	599350	Steep slope with extensive short grassland but much dominated by bracken (or various intermediate stages); mossy with <i>Hylocomium splendens</i> , <i>Scleropodium purum</i> , <i>Rhytidiadelphus squarrosus</i> , and occasional short <i>Galium saxatile</i> , <i>Oxalis acetosella</i> , <i>Viola riviniana</i> , <i>Rumex acetosa</i> and <i>Potentilla erecta</i> .
45	313664	599424	Narrow flush with <i>Nardus stricta</i> and <i>Molinia caerulea</i> plus <i>Carex</i> spp., <i>Briza minor</i> and <i>Palustriella falcata</i> .
46	313641	599452	Grassland locally more acidic (some <i>Pleurozium schreberi</i> and occasional short heather).
47	313459	599400	<i>Juncus acutiflorus</i> flushing with <i>Carex</i> spp., <i>Calliergonella cuspidata</i> and small spring with <i>Cratoneuron commutatum</i> .
48	313416	599437	Shallow peat edge with <i>Juncus effusus</i> strip but with acid grass pasture below.
49	313400	599445	Boggy slope with occasional <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , some <i>Sphagnum</i> , <i>Deschampsia flexuosa</i> and <i>Juncus squarrosus</i> .
50	313229	599431	Small depression with much <i>Sphagnum fallax</i> plus <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum commune</i> , plus some <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> .
51	313357	599527	Coarser acid grassland on slope here with abundant <i>Polytrichum commune</i> , and some <i>Molinia caerulea</i> .
52	313613	599483	Short grazed heath relic (some <i>Erica cinerea</i> ).
53	313600	599481	Small burn with gravelly flushing ( <i>Calliergonella cuspidata</i> , <i>Juncus</i> spp., <i>Ranunculus acris</i> , <i>Lysimachia nemorum</i> , <i>Prunella vulgaris</i> ).
54	313534	599557	Local heather with <i>Blechnum spicant</i> , <i>Carex binervis</i> , <i>Festuca ovina</i> and <i>Hylocomium splendens</i> .
55	313512	599578	Narrow flush ( <i>Juncus acutiflorus</i> ) with some short grazed <i>Filipendula ulmaria</i> .



56	313508	599608	Flush with some <i>Molinia caerulea</i> plus <i>Calliergonella cuspidata</i> , <i>Carex</i> spp., <i>Lysimachia nemorum</i> , <i>Filipendula ulmaria</i> (short) and <i>Cirsium palustre</i> .
57	313415	599738	Sloping hillside with dense cover of shrubby heather (40cm +) with <i>Vaccinium myrtillus</i> , occasional <i>Erica cinerea</i> , few grasses, <i>Blechnum spicant</i> and mosses include abundant <i>Hylocomium splendens</i> , with <i>Pleurozium schreberi</i> , <i>Breutelia chrysocoma</i> and <i>Dicranum scoparium</i> .
58	313306	599719	Flushing with frequent <i>Molinia</i> but also much <i>Vaccinium myrtillus</i> and heather; mosses include frequent <i>Polytrichum commune</i> .
59	313251	599719	Open grassy glade ( <i>Molinia</i> and bracken to margins) with short-grazed but quite broad-leaved grasses ( <i>Holcus lanatus</i> and <i>Dactylis glomerata</i> ).
60	313187	599761	Upper slope with increased <i>Molinia</i> plus <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> .
61	313156	599727	Increasing <i>Eriophorum vaginatum</i> with heather plus <i>Molinia</i> , <i>Vaccinium</i> (some <i>V. vitis-idaea</i> ), <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and <i>Sphagnum capillifolium</i> .
62	313023	599725	Drier ridge with <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and some <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> ; depression below with much <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> and <i>Carex nigra</i> .
63	312965	599845	Gentler slope above steep heather domination but now with increased <i>Molinia caerulea</i> , <i>Eriophorum vaginatum</i> and occasional <i>Sphagnum capillifolium</i> .
64	312870	599863	Dramatic contrast east of the wall compared to grazed <i>Eriophorum vaginatum</i> bog to west side. The ridge undulates with a more wet heath type domination to higher ground: mostly <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Molinia caerulea</i> but some <i>Eriophorum vaginatum</i> plus <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> . Lower depressions though have increased <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> , and often more frequent <i>Molinia caerulea</i> .
65	312917	599883	Steepening slope with <i>Calluna vulgaris</i> dominating plus <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
66	312957	599961	Narrow flushed bank between heather dominated steep slope and burn embankment; <i>Molinia</i> and <i>Juncus</i> frequent but locally diverse with <i>Carex</i> spp., <i>Ajuga reptans</i> , <i>Potentilla sterilis</i> and <i>Anemone nemorosa</i> .
67	312983	599985	Burn valley with bracken and heather to steep slopes, rare scrub (rowan, willow and hawthorn), ferns (some <i>Dryopteris affinis</i> and <i>Equisetum sylvaticum</i> ) plus herbs such as <i>Oxalis acetosella</i> , <i>Luzula pilosa</i> and <i>Viola riviniana</i> .
68	313091	600086	Small area, difficult to map or classify, but with some relic wet heath (or bog) elements, <i>Eriophorum vaginatum</i> but also <i>Carex</i> species, acid grassland elements and bracken.
69	313295	599947	Broad valley with open grassland, gravels, flushes, bracken and developing scrub woodland (grey and eared willows, and hybrid, plus hawthorn, rowan and some birch, and a couple of pines); species diversity high with <i>Holcus mollis</i> , <i>Digitalis purpurea</i> , <i>Teucrium scorodonia</i> , <i>Hypericum pulchrum</i> , <i>Primula vulgaris</i> , <i>Stellaria holostea</i> , <i>Galium verum</i> , <i>Thymus polytrichus</i> <i>Pilosella officinarum</i> , <i>Potentilla sterilis</i> , <i>Carex laevigata</i> and <i>Pimpinella saxifraga</i> .
70	313541	600158	Rock outcrop with much <i>Erica cinerea</i> heath plus <i>Teucrium scorodonia</i> , <i>Dryopteris affinis</i> , <i>Blechnum spicant</i> and some <i>Chamerion angustifolium</i> and mosses include <i>Racomitrium aquaticum</i> , <i>Andreaea</i> sp., <i>Campylopus atrovirens</i> and one area with flushed <i>Sphagnum palustre</i> . Scree below with more <i>Cryptogramma crispa</i> .
71	313565	600160	Scree with much <i>Racomitrium lanuginosum</i> and sparse <i>Cryptogramma crispa</i> .
72	313695	600171	Boggy strip spills down slope but now with much <i>Molinia caerulea</i> (with <i>Vaccinium myrtillus</i> and some <i>Eriophorum vaginatum</i> ); becoming more ( <i>Molinia</i> ) wet heath like

			below.
73	313694	600439	Narrow strip of bog relic parallel with fence but with only sparse <i>Eriophorum vaginatum</i> ; some <i>Vaccinium vitis-idaea</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> and <i>Empetrum nigrum</i> .
74	313759	600628	Bog with much <i>Vaccinium myrtillus</i> and frequent <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> and local <i>Sphagnum</i> , but scarce <i>Calluna vulgaris</i> ; abundant spruce colonists.
75	313769	600700	Narrow summit ridge, level, with very tussocky relic bog (peat c. 40cm) but also dominated by <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> , and hypnoid mosses, but with occasional <i>Eriophorum vaginatum</i> and some <i>Sphagnum</i> ; other species include <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , and more sparingly <i>Juncus squarrosus</i> , <i>Empetrum nigrum</i> and <i>Trichophorum germanicum</i> (some spruce invasives).
76	313655	600783	Heather dominated slope but here (and extending up to crest further north) <i>Molinia caerulea</i> becoming frequent but vegetation otherwise similar to rest of slope.
77	313555	600824	Strip of grassland up slope but above dense dry heath dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses; some <i>Lycopodium clavatum</i> (but seemingly very rare).
78	313530	600859	Gravelly stream bed with short grassland plus some flushes and bracken zones; diverse species include <i>Thymus polytrichus</i> , <i>Equisetum sylvaticum</i> , <i>Tussilago farfara</i> and <i>Carex laevigata</i> .
79	313398	600962	Small flush and open scree with (rare <i>Cryptogramma crispa</i> ) in otherwise dense bracken cover; some <i>Thymus polytrichus</i> and <i>Campanula rotundifolia</i> to grassy margins.
80	313855	600953	Locally increased <i>Molinia caerulea</i> .
81	313880	601048	Narrow strip of bog vegetation extends as a 10m strip parallel to fence; <i>Vaccinium myrtillus</i> abundant with some <i>Eriophorum vaginatum</i> (but scarce) plus <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberi</i> with occasional <i>Erica tetralix</i> , <i>Calluna vulgaris</i> and some <i>Sphagnum capillifolium</i> .
82	313765	601337	Steep sided gully with scree supporting some <i>Thymus polytrichus</i> , <i>Pilosella officinarum</i> , <i>Viola riviniana</i> , <i>Potentilla sterilis</i> and, in flushes, <i>Chrysosplenium oppositifolium</i> and <i>Cochlearia officinalis</i> .
83	313879	601361	Lower slopes dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> with <i>Pleurozium schreberi</i> , <i>Hypnum jutlandicum</i> , <i>Dicranum scoparium</i> , and occasional wet heath or bog element ( <i>Erica tetralix</i> , <i>Eriophorum</i> spp., <i>Vaccinium vitis-idaea</i> ).
84	313554	601452	Extensive steep hillside dominated by <i>Calluna vulgaris</i> but with locally much <i>Vaccinium myrtillus</i> (some with <i>Erica tetralix</i> and <i>Molinia caerulea</i> ) plus <i>Deschampsia flexuosa</i> marking local grassy patches.
85	313879	601536	Bog spill parallel fence with some <i>Eriophorum vaginatum</i> (and local <i>E. angustifolium</i> ); peat locally deep (40cm).
86	313840	601641	Summit area with extensive cover of blanket bog: <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> plus <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Juncus squarrosus</i> , <i>Deschampsia flexuosa</i> , <i>Hypnum jutlandicum</i> and some <i>Sphagnum capillifolium</i> (local spruce colonists).
87	313862	601751	Bog continues east of fence on slope to plantation, with occasionally high heather domination but generally similar blanket bog cover.
88	313789	601761	Heather dominating on steepening slope (occasional <i>Eriophorum vaginatum</i> ) with <i>Vaccinium myrtillus</i> , <i>V. vitis-idaea</i> , <i>Juncus squarrosus</i> and occasional <i>Sphagnum capillifolium</i> patch and even some <i>Leucobryum glaucum</i> .
89	313829	601820	<i>Eriophorum</i> increases to north but otherwise similar <i>Calluna</i> – <i>Eriophorum</i> bog (peat not deep though) with <i>Juncus squarrosus</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum</i>

			angustifolium, and <i>Trichophorum germanicum</i> .
90	313697	601873	Mossy <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Hypnum jutlandicum</i> and <i>Pleurozium schreberi</i> , with some <i>Sphagnum capillifolium</i> , <i>Plagiothecium undulatum</i> and <i>Lophozia ventricosa</i> .
91	313816	602020	Extensive <i>Calluna vulgaris</i> - <i>Eriophorum vaginatum</i> bog with occasional <i>Sphagnum capillifolium</i> and <i>Pleurozium schreberi</i> , plus <i>Vaccinium myrtillus</i> , <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Juncus squarrosus</i> and <i>Hypnum jutlandicum</i> (peat c. 25cm).
92	313785	602104	Increased <i>Calluna vulgaris</i> here, more dry heath appearance, with <i>Vaccinium</i> spp., <i>Pleurozium schreberi</i> , <i>Hypnum jutlandicum</i> and <i>Dicranum scoparium</i> .
93	313609	602038	Narrow flush below bog with some <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> , but increasingly <i>Juncus effusus</i> below with <i>Carex echinata</i> , <i>Viola palustris</i> and some <i>Cardamine pratensis</i> .
94	313585	601952	Valley head with bog spill, dry and wet heath and some open (or flushed) grassy areas; <i>Juncus acutiflorus</i> with <i>Holcus mollis</i> , and some flushed <i>Nardus stricta</i> grassland (with <i>Carex binervis</i> ).
95	313434	601917	Grassland patches (some flushed) but here with <i>Potentilla sterilis</i> , <i>Viola riviniana</i> , <i>Ranunculus acris</i> , <i>Veronica chamaedrys</i> and <i>Galium verum</i> .
96	313341	601779	Hill slope with some grassy but frequently flushed and very diverse: <i>Holcus mollis</i> , <i>Ajuga reptans</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> , <i>Carex flacca</i> , <i>C. panicea</i> , <i>C. echinata</i> , <i>Galium uliginosum</i> , <i>Filipendula ulmaria</i> , <i>Lysimachia nemorum</i> , <i>Epilobium palustre</i> , <i>Succisa pratensis</i> and mosses include <i>Calliergonella cuspidata</i> and <i>Philonotis fontana</i> .
97	313424	601610	Local flush with <i>Juncus acutiflorus</i> and some <i>Nardus stricta</i> ; associates include <i>Carex laevigata</i> , <i>Ajuga reptans</i> , <i>Carex flacca</i> , <i>C. nigra</i> , <i>Filipendula ulmaria</i> and <i>Lathyrus pratensis</i> .
98	313438	601608	Narrow steep valley with rock outcrop here (rare rowan with ferns <i>Dryopteris affinis</i> and <i>Oreopteris limbosperma</i> ); diverse flora with some <i>Thymus polytrichus</i> , <i>Luzula sylvatica</i> , <i>Hypericum pulchrum</i> , <i>Oxalis acetosella</i> , <i>Crepis paludosa</i> etc.; bryophytes also diverse with <i>Sphagnum squarrosum</i> , <i>S. subnitens</i> , <i>Breutelia chryscoma</i> , <i>Bryum pseudotriquetrum</i> , <i>Dicranella palustris</i> , <i>Scapania</i> and <i>Hygrohypnum</i> sp.
99	313272	601640	Wet bog spill continues over fence but with little <i>Calluna vulgaris</i> and more <i>Vaccinium myrtillus</i> plus some <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Deschampsia flexuosa</i> and <i>Pleurozium schreberi</i> .
100	312619	599686	Small ridge with bracken with <i>Holcus mollis</i> and small population of <i>Hyacinthoides non-scripta</i> .
101	312451	599689	Flushes with locally high species diversity <i>Ajuga reptans</i> , <i>Lysimachia nemorum</i> , <i>Carex pulicaris</i> and <i>Carex laevigata</i> .
102	312311	599811	Broad valley mire with much <i>Juncus acutiflorus</i> plus <i>Molinia caerulea</i> , <i>Carex</i> spp., <i>Galium uliginosum</i> and <i>Narthecium ossifragum</i> ; more enriched further below more with some <i>Holcus lanatus</i> and <i>Deschampsia cespitosa</i> .
103	312274	599861	Relic graminoid wet heath (but very mire like) with abundant <i>Molinia caerulea</i> with <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Agrostis canina</i> , <i>Carex echinata</i> , <i>Deschampsia flexuosa</i> and some <i>Dactylorhiza maculata</i> .
104	312242	599909	Deep peat here with some <i>Eriophorum vaginatum</i> , but much <i>Sphagnum</i> , but mostly grassy with <i>Agrostis canina</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> with <i>Polytrichum commune</i> and <i>Erica tetralix</i> .
105	312536	599957	Steep embankment with locally much bracken and some areas of dry heath ( <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Luzula pilosa</i> , <i>Deschampsia flexuosa</i> and occasional <i>Erica cinerea</i> ).

106	312735	599924	Large area marked by increased <i>Eriophorum vaginatum</i> (and other wet heath dominants) plus a little <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and <i>Sphagnum capillifolium</i> .
107	312829	600040	Small valley with short grassland, bracken and rush zones; locally diverse with <i>Ajuga reptans</i> , <i>Holcus mollis</i> , <i>Equisetum sylvaticum</i> and <i>Carex laevigata</i> .
108	312534	600097	Local patch of heath and some scree patches (some <i>Racomitrium lanuginosum</i> moss and <i>Sphaerophorus</i> lichen); <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Deschampsia flexuosa</i> , <i>Carex pilulifera</i> , occasional <i>Erica cinerea</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
109	312608	600138	Gentler slopes with tussocky wet heath dominated by <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Molinia caerulea</i> (the latter being chief separation from drier heath on steeper slopes).
110	312617	600231	Level area with patch of wet heath but with some bog elements ( <i>Eriophorum vaginatum</i> and a little <i>Sphagnum</i> - but not much).
111	312623	600294	Long flush down slope and feeding narrow gully with abundant <i>Molinia caerulea</i> ; tussocky and with some <i>Vaccinium myrtillus</i> indicating wet heath affinities (rather than mire).
112	312405	600154	Flushing with <i>Carex</i> spp., plus <i>Nardus stricta</i> and some <i>Briza media</i> .
113	312335	600188	Flushed acid grassland with much <i>Carex panicea</i> and <i>C. flacca</i> plus <i>Molinia caerulea</i> , <i>Juncus bulbosus</i> and <i>Briza media</i> .
114	312305	600202	Species rich flushed grassland and <i>Juncus acutiflorus</i> mire: <i>Carex laevigata</i> , <i>Galium palustre</i> , <i>G. uliginosum</i> , <i>Viola palustris</i> , <i>Cirsium palustre</i> , and some more acidic flushing with <i>Nardus stricta</i> and <i>Narthecium ossifragum</i> .
115	312235	600262	Long narrow <i>Juncus effusus</i> (mostly) flush through sea of bracken; rich associates include <i>Lysimachia nemorum</i> , <i>Ranunculus flammula</i> , <i>Potentilla sterilis</i> , <i>Carex pulicaris</i> , <i>C. demissa</i> , <i>C. flacca</i> , <i>Galium uliginosum</i> , <i>Juncus conglomeratus</i> and locally some <i>Dactylorhiza maculata</i> .
116	312827	600405	Strip dominated by <i>Vaccinium myrtillus</i> , with much <i>Pleurozium schreberii</i> and <i>Deschampsia flexuosa</i> but limited <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> .
117	312781	600469	Leveller area with increased <i>Eriophorum vaginatum</i> plus much <i>Pleurozium schreberi</i> with <i>Calluna vulgaris</i> , <i>Deschampsia flexuosa</i> and <i>Erica tetralix</i> .
118	312369	600553	Rocks and scree exposures in other heather dominated hillside; frequent <i>Teucrium scorodonia</i> below crags and scree with <i>Racomitrium lanuginosum</i> and <i>Sphaerophorus</i> lichen; other species include hazel, honeysuckle, <i>Dryopteris oreades</i> and <i>Veronica officinalis</i> .
119	312518	600566	Upper slope with heather dominated cover but few bog relic elements (very scarce <i>Eriophorum</i> ) with much <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> but few other associates noted.
120	312508	600688	Extensive steep hillside dominated by <i>Calluna vulgaris</i> , with frequent <i>Vaccinium myrtillus</i> and much <i>Pleurozium schreberi</i> and other mosses such as <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> and <i>Dicranum scoparium</i> , plus rarely <i>Dryopteris dilatata</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium vitis-idaea</i> , <i>Rhytidiadelphus loreus</i> and very rarely <i>Eriophorum vaginatum</i> .
121	312732	600621	Heather dominated slope but locally with wet heath or bog elements but few of the latter; here an old drain (or track?) feeding flushed valley, with much <i>Trichophorum germanicum</i> and <i>Eriophorum vaginatum</i> .
122	312682	600706	Level plateau with peat c. 20cm deep with a blanket bog cover: <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> and <i>Pleurozium schreberii</i> common with <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> , <i>Deschampsia flexuosa</i> , <i>Rhytidiadelphus squarrosus</i> but little <i>Sphagnum</i>



			(rare hollows, and even rare hummocks).				
123	312847	600873	Upper burn head with often intermediate heath or bog relic spill vegetation (peat quite deep in place but <i>Eriophorum vaginatum</i> scarce to local); central flush with more <i>Eriophorum</i> plus <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Narthecium ossifragum</i> , <i>Pleurozium schreberii</i> , <i>Polytrichum commune</i> and some <i>Sphagnum</i> (rare <i>S. papillosum</i> ).	135	312717	601624	Wet acidic grassland below rush flush with <i>Carex</i> spp and some <i>Juncus bulbosus</i> and <i>J. articulatus</i> . Also stand of <i>Cirsium arvense</i> invading from below. Bracken increasingly dominant to drier grassy (and heathy) surrounds.
124	312866	600989	Extensive blanket bog on summit ridge (but peat no very deep) with much <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> and <i>Pleurozium schreberii</i> with local <i>Vaccinium myrtillus</i> , plus <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus loreus</i> and <i>Hypnum jutlandicum</i> (some spruce colonists).	136	312730	601688	<i>Juncus acutiflorus</i> flushes feeding small gully (heather with <i>Oreopteris limbosperma</i> ); <i>Filipendula ulmaria</i> , <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> (some double-flowered) and rare <i>Carex laevigata</i> .
125	312722	601002	Broad bog spill (peat c. 20cm deep) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> prominent plus rare to occasional <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum capillifolium</i> .	137	312944	601598	Large area of open grassland below, some quite acidic, with local <i>Nardus stricta</i> ; flushes here with <i>Anemone nemorosa</i> , <i>Valerian dioica</i> , <i>Carex flacca</i> , <i>Galium verum</i> , <i>Lathyrus pratensis</i> and <i>Equisetum arvense</i> .
126	312644	600924	More distinct, but diffuse, big spill to here; occasional to frequent <i>Eriophorum vaginatum</i> with some <i>Sphagnum capillifolium</i> and <i>Molinia caerulea</i> , but still much <i>Calluna</i> and <i>Vaccinium</i> .	138	313008	601615	Large area of <i>Molinia</i> dominated vegetation (with wet heath elements) about old drain, feeding flushes below ( <i>Succisa pratensis</i> , <i>Cardamine pratensis</i> and <i>Valeriana dioica</i> ).
127	313090	601027	Extensive tussocky dry blanket bog (peat c. 30cm) with much <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> , plus <i>Vaccinium vitis-idaea</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Molinia caerulea</i> , <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> but seemingly little <i>Sphagnum</i> , and some scattered spruce colonists.	139	313156	601669	Tussocky dry bog with much <i>Calluna vulgaris</i> and <i>Pleurozium schreberi</i> though <i>Eriophorum vaginatum</i> often scattered; plus some <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and occasional <i>Sphagnum capillifolium</i> .
128	312372	601145	Leveller ground below steep slope (peat c. 30cm) with frequent <i>Eriophorum vaginatum</i> plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , with occasional <i>Sphagnum capillifolium</i> , <i>Empetrum nigrum</i> and <i>Trichophorum germanicum</i> ; <i>Eriophorum</i> decreases as hill slope steepens but <i>Molinia</i> persists.	140	313106	601684	Increased <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> (on deep peat) with scattered <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> , <i>Pleurozium schreberii</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
129	312686	601179	Local area with increased <i>Vaccinium myrtillus</i> and decreased <i>Calluna vulgaris</i> , plus <i>Molinia caerulea</i> , <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and some <i>Eriophorum vaginatum</i> (mainly above).	141	312937	601741	Increased <i>Calluna vulgaris</i> but with occasional <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> and peat c. 25cm (intermediate wet and dry heath).
130	312821	601250	Local areas with some <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> and <i>Vaccinium vitis-idaea</i> but no <i>Eriophorum vaginatum</i> (except up slope); peat c. 30cm deep.	142	312766	601845	Central leveller area with much <i>Eriophorum vaginatum</i> (but also extending up or down the margins of the hill slope), with <i>Molinia caerulea</i> and some <i>Sphagnum</i> (very rare <i>S. papillosum</i> noted) but also drier <i>Calluna vulgaris</i> and <i>Deschampsia flexuosa</i> ; intermediate wet heath and bog relic.
131	313015	601272	Bog spill but with little <i>Eriophorum vaginatum</i> here but some other bog relics ( <i>Empetrum nigrum</i> , <i>Vaccinium</i> spp., <i>Molinia caerulea</i> and <i>Pleurozium schreberii</i> ) but mostly dry <i>Calluna vulgaris</i> dominated. Some local wet heath patches and occasional bog spills.	143	312858	601920	Leveller strip wit increased <i>Eriophorum vaginatum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> and <i>Sphagnum capillifolium</i> ; peat c. 25cm deep.
132	313140	601313	Small flush in slight valley (dry heath lined) with increased graminoids ( <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> ); near fence very wet mire with <i>Sphagnum</i> carpet (some <i>S. papillosum</i> ) plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , and <i>Aulacomnium palustre</i> .	144	313132	601792	Heather dominated but with <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> and <i>Pleurozium schreberii</i> but <i>Eriophorum vaginatum</i> now rare (peat c. 30cm though); some <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> and <i>Rhytidiadelphus squarrosus</i> .
133	313141	601438	Broad ridge on gentle slope or level (peat 30+cm); <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> plus <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus</i> spp but scarce <i>Sphagnum capillifolium</i> .	145	313238	601885	Small bog pool ( <i>Eriophorum angustifolium</i> and <i>Sphagnum papillosum</i> ); bog here with a little more <i>Sphagnum</i> plus <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
134	312794	601499	Steep sided burn (and feeders) with a very rich (but compact) diversity with <i>Teucrium scorodonia</i> , <i>Thymus polytrichus</i> , <i>Erica cinerea</i> , <i>Lathyrus linifolius</i> , <i>Hieracium vulgatum</i> , <i>Linum catharticum</i> , <i>Selaginella selaginoides</i> , <i>Galium sternerii</i> and <i>Rubus saxatilis</i> .	146	313018	602005	<i>Juncus acutiflorus</i> dominated flush (locally wet acid grassland with <i>Carex</i> spp.); <i>Carex hostiana</i> , <i>C. pulicaris</i> , <i>C. echinata</i> , <i>Taraxacum</i> sp., <i>Viola palustris</i> , <i>Ajuga reptans</i> , <i>Poa trivialis</i> , <i>Prunella vulgaris</i> and <i>Cardamine pratensis</i> .
				147	313118	602050	Broad leveller area on otherwise steep slope; here with some flushed acid grassland ( <i>Carex</i> spp.) plus wet heath elements including locally much <i>Molinia caerulea</i> .
				148	313895	602285	Small flush with <i>Sphagnum papillosum</i> and <i>Aulacomnium palustre</i> .
				149	313885	602298	Level area of bog but with reduced <i>Eriophorum vaginatum</i> but frequent <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> and some <i>Rubus chamaemorus</i> .
				150	313923	602400	Rising ground but little <i>Eriophorum vaginatum</i> ; <i>Calluna vulgaris</i> dominated with <i>Vaccinium</i> spp., <i>Eriophorum angustifolium</i> , <i>Pleurozium schreberi</i> and <i>Hypnum jutlandicum</i> but little <i>Sphagnum capillifolium</i> ; some <i>Melampyrum pratense</i> near fence.
				151	313992	602460	Hill slope with extensive domination by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Pleurozium schreberii</i> , <i>Hypnum jutlandicum</i> , plus occasional <i>Molinia caerulea</i> , <i>Erica tetralix</i> and very rare <i>Eriophorum vaginatum</i> .
				152	314098	602449	Broad strip to forest edge with (north of here) much <i>Molinia caerulea</i> plus some <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Nardus stricta</i> ; similar to south

			but mixed with wet acid grassland and some bog or heath elements.
153	314066	602554	Leveller ridge about fence junction with distinct boggy relics (much <i>Eriophorum vaginatum</i> ; some <i>Melampyrum pratense</i> noted).
154	313971	602547	Grassy glades in otherwise dense heather domination; <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> , <i>Festuca ovina</i> , <i>Juncus squarrosus</i> , <i>Potentilla erecta</i> , <i>Galium saxatile</i> but with <i>Vaccinium</i> spp, and often much <i>Polytrichum commune</i> .
155	314278	602527	Extensive domination by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and <i>Hypnum jutlandicum</i> , plus local <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>Juncus squarrosus</i> , and very rarely <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> and <i>Eriophorum</i> spp. Peat c. 20cm deep. Some <i>Carex bigelowii</i> noted (but rare).
156	314252	602571	Small scattered islets with bog relics: <i>Eriophorum</i> spp., plus more <i>Empetrum</i> and <i>Vaccinium</i> spp.
157	314233	602597	Ridge about fence supporting more boggy elements but often small patches or diffuse <i>Eriophorum</i> spp., <i>Trichophorum germanicum</i> , <i>Empetrum nigrum</i> , <i>Juncus squarrosus</i> etc. but peat seems shallow; some <i>Rubus chamaemorus</i> noted.
158	314167	602578	Similar appear heathy vegetation but here with more <i>Eriophorum vaginatum</i> and some mossy hummocks (but scarce <i>Sphagnum capillifolium</i> ) with mostly rare <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium vitis-idaea</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> .
159	314055	602682	Steep slope dominated by heather but locally with increased <i>Vaccinium myrtillus</i> (often above) and locally damper with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Polytrichum commune</i> and some <i>Sphagnum capillifolium</i> ; below and to northwest several patches of acid grass (some intermediate or mosaics).
160	314192	602793	Grassy glades extending up steep slope with <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> , <i>Festuca ovina</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> ; some (rare?) <i>Carex bigelowii</i> .
161	314360	602894	Locally much increased <i>Vaccinium myrtillus</i> (and some high cover of <i>V. vitis-idaea</i> ), plus acidic grassy glades.

#### Target notes for main central area with Laverhay Height and Milne Height

1	318052	593944	Local ridge with bracken on slope otherwise short grazed somewhat enriched bent fescue pasture (some <i>Viola lutea</i> ).
2	318026	594110	Relic graminoid wet heath or bog with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> .
3	317924	594132	Slope with wet grassland and much <i>Molinia caerulea</i> with some <i>Carex nigra</i> and <i>Juncus squarrosus</i> , and occasional <i>Eriophorum vaginatum</i> .
4	317942	594181	Small patch of <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> plus <i>Vaccinium myrtillus</i> (and <i>Nardus stricta</i> , <i>Carex binervis</i> acid grassland).
5	317729	593829	Steep ridge with bracken below; to south a series of ridges and hillocks with mosaic of bracken and short grassland.
6	317722	593841	Historical ground works, with some acidic grassland (local <i>Juncus squarrosus</i> ) and marshy to centre; bracken to steeper embankment below.
7	317631	593822	Enriched short grazed pasture down undulating slope (steeper ridges less enriched, and locally with bracken); also occasional flush line with <i>Juncus effusus</i> (plus <i>Calliergonella cuspidata</i> , <i>Ranunculus</i> spp., <i>Carex</i> spp., <i>Deschampsia cespitosa</i> and <i>Cynosurus cristatus</i> ).
8	317775	594064	Band of more acidic and poorly draining grassland ( <i>Nardus stricta</i> , <i>Molinia caerulea</i> )

			with much moss ( <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> ) extends down slope terminating in <i>Juncus effusus</i> patch.
9	317671	594066	Strip of wet acid grassland ( <i>Agrostis canina</i> , <i>Molinia</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> etc).
10	317689	594124	Steep slope with acidic grassland (some intermediate between U5 and U4) with <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Carex binervis</i> , rare <i>Calluna vulgaris</i> , and mosses include <i>Hylocomium splendens</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Polytrichum commune</i> .
11	317542	594094	Acid grassland with increasing heath elements ( <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> ).
12	317517	594091	Grassy flush below <i>Juncus effusus</i> with some bog elements ( <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> spp. (some <i>S. papillosum</i> ), <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> ).
13	317498	593990	Boggy relics parallel to <i>Juncus effusus</i> mire about drain; <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Nardus stricta</i> , <i>Sphagnum capillifolium</i> and other mosses.
14	317470	593956	<i>Juncus</i> mire in shallow valley with freer draining slopes to embankments; locally with boggy relic by flushes with <i>Eriophorum vaginatum</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> and some <i>Sphagnum capillifolium</i> .
15	317355	593795	Small valley with <i>Juncus acutiflorus</i> marsh with <i>Ranunculus</i> spp., <i>Calliergonella cuspidata</i> , <i>Veronica beccabunga</i> , <i>Cardamine pratensis</i> and <i>Lysimachia nemorum</i> .
16	317344	594021	Wet bog relics extend down to, and across, fence with <i>Eriophorum vaginatum</i> but drier with more <i>Juncus squarrosus</i> and <i>Polytrichum commune</i> .
17	317378	594063	Steeper ridge with bog relics giving way to <i>Juncus acutiflorus</i> mire (but more bog below).
18	317442	594121	Slope with frequent <i>Eriophorum vaginatum</i> and other bog or wet heath relics ( <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Rhytidiadelphus loreus</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Sphagnum capillifolium</i> and occasional <i>S. fallax</i> or <i>S. papillosum</i> ).
19	317484	594185	<i>Juncus effusus</i> spills down acid grassland slope, which in general is flushed and wet ( <i>Carex nigra</i> , <i>Deschampsia cespitosa</i> ); below with dense bracken and developing willow scrub.
20	317438	594160	Acid grassland but with much <i>Polytrichum commune</i> , <i>Sphagnum</i> (some <i>S. russowii</i> ), <i>Rhytidiadelphus loreus</i> , <i>Carex nigra</i> , <i>Agrostis canina</i> sl., <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and some short heather.
21	317292	594290	Bog or wet heath relics ( <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and <i>Sphagnum</i> ; bracken dense further below with immature birch wood (north side woodland with more ash).
22	317242	594292	Spring (with some tufa) and bryophytes include <i>Palustriella commutata</i> with <i>Dicranodontium</i> and <i>Drepanocladus</i> spp., plus <i>Selaginella selaginoides</i> , <i>Carex flacca</i> , <i>C. demissa</i> , <i>C. dioica</i> , and <i>Briza media</i> .
23	317226	594300	Burn side rocks with small areas of heather plus some <i>Thymus polytrichus</i> and <i>Pilosella officinarum</i> .
24	317195	594296	Flushed grassland above burn, locally with <i>Palustriella commutata</i> springs.
25	317256	594166	Increasing <i>Eriophorum vaginatum</i> (and some <i>Trichophorum germanicum</i> ) but mostly tussocky wet <i>Nardus</i> type grassland.
26	317350	594144	Leveller area with increased <i>Eriophorum vaginatum</i> and other boggy relics. Grading on slopes to wet acidic grassland (difficult to demarcate).
27	317194	594100	Large relic boggy zone, drained; <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Sphagnum capillifolium</i> , (rare <i>S. papillosum</i> ), <i>Pleurozium schreberi</i> , <i>Aulacomnium</i>



			palustre and <i>Rhytidiadelphus squarrosus</i> .
28	317275	594105	Wet tussocky acid grassland with <i>Eriophorum vaginatum</i> relics.
29	317282	594042	Extensive slope with <i>Nardus stricta</i> grassland with occasional <i>Eriophorum vaginatum</i> relics, <i>Deschampsia flexuosa</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Luzula multiflora</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
30	317194	594048	Acid grassland but with some wet heath relics (occasional <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> and <i>Sphagnum</i> ).
31	317302	593980	Wetter mire with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , some short <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum fallax</i> (abundant), <i>S. cuspidatum</i> , <i>S. capillifolium</i> , <i>Aulacomnium palustre</i> and <i>Rhytidiadelphus loreus</i> .
32	317283	593975	Shallow depression between ridges with relic tussocky bog: <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , some <i>Vaccinium myrtillus</i> and <i>Calluna vulgaris</i> , and much moss with <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium palustre</i> and <i>Sphagnum capillifolium</i> . Peat c. 20cm deep.
33	317244	593933	Wet mire area with <i>Sphagnum fallax</i> and <i>Carex nigra</i> .
34	317195	593943	Drained boggy depression with several cells of relic bog vegetation (peat c. 30cm deep) <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>S. cuspidatum</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Pleurozium schreberi</i> .
35	317178	593978	Relic graminoid bog (with wet <i>Nardus</i> grassland): <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , some <i>Erica tetralix</i> , and much moss <i>Sphagnum capillifolium</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> (peat c. 25cm).
36	317161	593999	Bog relics with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus loreus</i> .
37	317208	593769	Area of mostly improved pasture but with a band of bracken and a few <i>Juncus</i> lined flushes or drains; more acidic grass above.
38	317092	593629	<i>Juncus acutiflorus</i> (with <i>Molinia</i> ) extends up slope; associates as noted from below plus some <i>Carex flacca</i> , <i>Juncus conglomeratus</i> , <i>Lathyrus pratensis</i> and <i>Plagiomnium undulatum</i> (indicating less acidic conditions).
39	317032	593698	Narrow burn below steep hillside with <i>Juncus effusus</i> and species include <i>Veronica beccabunga</i> , <i>Ranunculus repens</i> , <i>Glyceria fluitans</i> and <i>Callitriche stagnalis</i> .
40	317073	593804	Marsh broadening in leveller valley; <i>Juncus acutiflorus</i> with <i>Ranunculus repens</i> , <i>Stellaria alsine</i> and <i>Callitriche stagnalis</i> and some short grazed <i>Filipendula ulmaria</i> .
41	316989	593881	Local <i>Juncus squarrosus</i> to margin of <i>Juncus</i> flushing.
42	316983	593941	Further boggy zone (c. 25cm deep peat) with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>E. angustifolium</i> , <i>Carex nigra</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum capillifolium</i> , some <i>S. papillosum</i> , <i>Polytrichum commune</i> and <i>Aulacomnium palustre</i> .
43	317078	593991	Central <i>Juncus acutiflorus</i> flush down shallow valley with <i>Juncus effusus</i> to west side.
44	316946	593992	Boggy relic with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Vaccinium oxycoccos</i> .
45	316941	594000	Small ridge of <i>Nardus</i> grassland separating bog relics.
46	316909	594014	Towards wall bog more mire-like ( <i>Sphagnum</i> ) with increasing <i>Juncus effusus</i> .
47	316927	594042	Boggy relic (c. 40cm deep peat) with sparse <i>Eriophorum vaginatum</i> plus <i>Calluna</i>

			<i>vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>S. cuspidatum</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> .
48	316940	594085	Wetter leveller area with much <i>Sphagnum fallax</i> with <i>Carex nigra</i> plus occasional <i>Eriophorum vaginatum</i> and <i>Pleurozium schreberi</i> ; plus <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> , <i>Polytrichum commune</i> , <i>Sphagnum capillifolium</i> and some short <i>Calluna vulgaris</i> .
49	316956	594079	Drier boggy relic with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> .
50	317046	594055	Extensive wet acid grassland but with relics of bog precursor, with frequent <i>Eriophorum vaginatum</i> tussocks; locally much <i>Carex nigra</i> with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> etc.
51	317070	594085	Shallow valley with acidic grassland meeting mire below (old drains and flushes complex); grassy <i>Juncus acutiflorus</i> with some <i>Viola palustris</i> , <i>Galium palustre</i> , <i>Ranunculus</i> spp., <i>Cardamine pratensis</i> , <i>Rumex acetosa</i> .
52	317091	594115	<i>Juncus acutiflorus</i> flush (between <i>J. effusus</i> drains/burns, grassy and mossy with some <i>Cardamine pratensis</i> , <i>Ranunculus repens</i> , <i>Holcus lanatus</i> and <i>Calliergonella cuspidata</i> ).
53	317133	594166	Wetter acid grassland: <i>Nardus stricta</i> , <i>Agrostis canina</i> , <i>Deschampsia flexuosa</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> , plus local <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> .
54	317003	594123	Wet <i>Eriophorum vaginatum</i> spills down slope (ending at <i>Juncus effusus</i> lined drain), with <i>Sphagnum</i> , <i>Polytrichum commune</i> , <i>Molinia caerulea</i> .
55	317019	594135	Wetter flushing with <i>Sphagnum fallax</i> abundant plus <i>Polytrichum commune</i> and occasional <i>Eriophorum vaginatum</i> relics.
56	316859	594244	Large patches (and some drain lines) with <i>Juncus effusus</i> (with short turf and mosses).
57	316835	594272	Acid grassland along ridge but local wetter hollow with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> .
58	316725	594571	Short-grazed wet heath extends to fence where taller <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and tussocky <i>Molinia caerulea</i> ; also stands of <i>Luzula sylvatica</i> on slope (limited scrub but a few rowan).
59	317187	593538	Extensive <i>Juncus</i> (and <i>Molinia</i> ) mire continues with acid grassland elements (more so near drains and higher ridges).
60	316711	593471	Local relic area of wet acidic grassland; <i>Juncus squarrosus</i> with <i>Sphagnum capillifolium</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Aulacomnium palustre</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> and <i>Rhytidiadelphus squarrosus</i> .
61	316721	593489	Old field dyke corner with short pasture all way up to wall above.
62	316628	593438	Boundary between rushy pasture below and short-grazed, better drained pasture, less clear and much intermediate.
63	316562	593471	Local patch of <i>Juncus effusus</i> , with <i>Deschampsia cespitosa</i> .
64	316520	593488	Local area of relic wet acid grassland ( <i>Nardus stricta</i> but frequent much <i>Molinia caerulea</i> ).
65	316446	593573	Plateau between small burns with relic patch of short grazed wet heath: <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Eriophorum</i> spp., <i>Sphagnum capillifolium</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus loreus</i> .
66	316718	593565	Lower slope transition to mire with less improved, wetter pasture ( <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Ranunculus acris</i> , <i>Deschampsia cespitosa</i> ).

67	316645	593673	Drained and tussocky mire edge with <i>Juncus acutiflorus</i> (some <i>Molinia caerulea</i> ) with <i>Cirsium palustre</i> , <i>Ficaria verna</i> , <i>Galium palustre</i> , <i>Cardamine pratensis</i> , <i>Succisa pratensis</i> , <i>Valeriana dioica</i> , <i>Lysimachia nemorum</i> , and mosses include <i>Philonotis fontana</i> , <i>Climacium dendroides</i> , <i>Calliergonella cuspidata</i> .
68	316617	593676	Extensive deep drained rushy mire continues up gentle slopes but with some large grassy patches (often about drains); <i>Juncus acutiflorus</i> common but with local <i>Molinia caerulea</i> , and often <i>Deschampsia cespitosa</i> , plus <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> , <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Ranunculus repens</i> , <i>Ficaria verna</i> and abundant mosses include <i>Rhytidiadelphus squarrosus</i> , <i>Scleropodium purum</i> , <i>Calliergonella cuspidata</i> and <i>Thuidium tamariscinum</i> .
69	316757	593762	Wet marshy grassland about small burn/drain; above more acidic with increasing <i>Nardus stricta</i> .
70	316877	593789	Boggy relic (peat 40 cm deep) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium oxycoccos</i> , <i>Aulacomnium palustre</i> and <i>Rhytidiadelphus loreus</i> .
71	316882	593811	Relic bog with <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Aulacomnium palustre</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Eriophorum angustifolium</i> and <i>Rhytidiadelphus loreus</i> . Peat c. 40cm deep.
72	316865	593837	Relic area of boggy mire (peat c. 30cm) with short grazed <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> ; <i>Sphagnum</i> cover high with <i>S. capillifolium</i> , <i>S. fallax</i> , <i>S. cuspidatum</i> , plus <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> .
73	316841	593948	Small area of <i>Juncus squarrosus</i> (intermediate to bog) and some <i>Juncus effusus</i> drains, and <i>Nardus</i> grassland flushed to hillside slope ( <i>Carex panicea</i> ).
74	316788	593892	Several cells of (drained) relic peat bog (30cm deep) with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> and thick mosses include <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
75	316662	593821	Rough boundary, marked by drains and flushed pasture (some <i>Carex</i> spp.), between rushy pasture below and better drained pasture up hillside above.
76	316502	593782	Local grassy ridges (and drain sides) with less <i>Juncus</i> (and <i>Molinia</i> ).
77	316494	593828	Top deep drain effectively separating drained rushy pasture below from (wet) acid grassland above.
78	316568	593904	Grassland rougher and more tussocky with increased <i>Nardus stricta</i> plus <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , occasional <i>Vaccinium myrtillus</i> and <i>Luzula multiflora</i> .
79	316140	593821	Steep-sided valley with acid grass, ferns (much bracken) and some old ash trees; ground above recently planted with broad-leaved trees.
80	316338	593964	Enriched short grazed pasture, locally more improved but some herb diversity locally (some <i>Viola lutea</i> ).
81	316208	594019	Acid grassland but with locally frequent <i>Molinia caerulea</i> plus <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Anthoxanthum odoratum</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> ; frequent <i>Juncus effusus</i> patches below.
82	316155	594047	Above more acidic pasture with <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Agrostis canina</i> , <i>Polytrichum commune</i> ; below better drained pasture (frequent <i>Juncus effusus</i> at boundary).
83	316125	594181	Broad strip of <i>Juncus effusus</i> down slope (and up), marking divide to more acidic grassland (with frequent <i>Molinia</i> ).
84	315945	594193	Small burn with <i>Juncus effusus</i> to sides; local spill of wet acid grass with some wet

			heath relics ( <i>Trichophorum</i> frequent).
85	316577	594006	More enriched (less acidic) flush area extending below as broad channel with much <i>Ficaria verna</i> , <i>Ranunculus repens</i> , <i>Poa annua</i> .
86	316628	594045	Broad, shallow valley head with mosaic of wet acidic grassland (U4 to U5) but also much prominent <i>Juncus effusus</i> .
87	316758	594095	Boggy hollow ( <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Calluna vulgaris</i> ) but otherwise <i>Nardus</i> grassland.
88	316699	594129	Drier boggy vegetation with <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Pleurozium schreberi</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> and <i>Rhytidiadelphus squarrosus</i> .
89	316725	594195	Bog relic (peat 40cm) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>V. vitis-idaea</i> , <i>Erica tetralix</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>S. fallax</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> and some <i>Cladonia</i> lichen.
90	316690	594235	Wetter hollow on summit ridge with <i>Eriophorum vaginatum</i> , <i>Sphagnum palustre</i> , <i>S. fallax</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> and <i>Molinia caerulea</i> .
91	316518	594134	Relic bog in small saddle with some deep peat (50cm); <i>Eriophorum vaginatum</i> , <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Pleurozium schreberi</i> , <i>Luzula multiflora</i> , <i>Vaccinium myrtillus</i> and <i>Juncus squarrosus</i> .
92	316509	594175	Bog relics grading to acid grassland (some deep peat 30cm), with <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Sphagnum capillifolium</i> etc.
93	316420	594127	Boggy crest with <i>Sphagnum fallax</i> and increased <i>Juncus squarrosus</i> and <i>Carex nigra</i> .
94	316298	594105	Slight hollow with much <i>Juncus effusus</i> with moss (some <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> ) with <i>Carex nigra</i> and rare <i>Eriophorum vaginatum</i> .
95	316328	594196	<i>Juncus effusus</i> hollow (below small U4 ridge) with occasional <i>Sphagnum fallax</i> and rare <i>Eriophorum vaginatum</i> , in extensive wet acid grassland.
96	316282	594241	<i>Carex nigra</i> with <i>Sphagnum</i> mire to side of <i>Juncus effusus</i> stand (broader above); rare <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> .
97	316432	594218	Boggy relics with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum</i> spp., <i>Pleurozium schreberi</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> and the liverwort <i>Mylia taylorii</i> .
98	316554	594235	Low ridge with grassy wet heath cover: <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum capillifolium</i> and other mosses.
99	316562	594288	Boggy vegetation on fairly deep peat (c. 30cm): <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Rhytidiadelphus loreus</i> , <i>R. squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
100	316663	594325	Drier ridge with <i>Nardus stricta</i> dominating but nearby wetter with ericoids and <i>Eriophorum vaginatum</i> .
101	316649	594352	Small spring ( <i>Cratoneuron commutatum</i> and <i>Drepanocladus</i> sp.) to top of <i>Juncus acutiflorus</i> flush.
102	316554	594401	Relic wet heath/bog area with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> and <i>Polytrichum commune</i> .
103	316474	594415	Boggy wet heath area with <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> and <i>Rhytidiadelphus loreus</i> .
104	316445	594366	Extensive wet acid grassland ( <i>Nardus</i> type) with some <i>Molinia caerulea</i> plus occasional <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> , plus <i>Agrostis canina</i> , <i>Juncus</i>



			squarrosus, <i>Hylocomium splendens</i> , <i>Polytrichum commune</i> and <i>Carex nigra</i>	126	315875	594357	Wet rushy pasture with much <i>Juncus acutiflorus</i> and moss.
105	316359	594412	Acid grassland slope but with increasing bog (or wet heath) relics: <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> and <i>Sphagnum capillifolium</i> .	127	315895	594229	Wetter bog here with <i>Sphagnum papillosum</i> , <i>Vaccinium myrtillus</i> but grading to wet <i>Juncus squarrosus</i> degraded bog.
106	316280	594369	Mosaic of grassy <i>Eriophorum vaginatum</i> with <i>Molinia caerulea</i> plus some ericoids and <i>Trichophorum germanicum</i> .	128	315883	594219	Wetter area with some short heather and much <i>Sphagnum</i> , plus some <i>Vaccinium oxycoccus</i> .
107	316218	594413	<i>Molinia caerulea</i> and <i>Nardus stricta</i> common (no ericoids), with <i>Juncus effusus</i> to wall.	129	316023	594322	Diverse but drained <i>Juncus acutiflorus</i> fen below embankment; initially some <i>Sphagnum</i> but mainly herbs: <i>Filipendula ulmaria</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> , <i>Ficaria verna</i> , <i>Taraxacum faeroense</i> .
108	316341	594440	Leveller area with increased <i>Sphagnum</i> ( <i>S. fallax</i> ) and some <i>Empetrum nigrum</i> ; otherwise graminoid wet heath (or bog as <i>Eriophorum vaginatum</i> common).	130	316006	594347	Embankment slope with little peat and wet heath cover ( <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> etc).
109	316348	594466	Wetter area of boggy vegetation with few ericoids but frequent <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , <i>Sphagnum fallax</i> and <i>Pleurozium schreberi</i> .	131	315977	594432	Wet bog transition vegetation with <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , occasional <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> .
110	316308	594501	Slope with short grazed wet heath ( <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> and some <i>Vaccinium vitis-idaea</i> ).	132	316063	594423	Wet flush with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> and <i>Carex nigra</i> .
111	315047	593730	Relic drained and short grazed bog with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> , <i>Narthecium ossifragum</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Sphagnum papillosum</i> , <i>S. fallax</i> and <i>Aulacomnium palustre</i> .	133	316120	594413	Long embankment on slope grading to bog margins on leveller ground above: <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> include <i>S. tenellum</i> and <i>S. compactum</i> .
112	315181	593762	Heavily grazed wet grassland with cropped <i>Juncus acutiflorus</i> with <i>Carex</i> spp., <i>Molinia caerulea</i> but seemingly quite diverse with some <i>Avenula pubescens</i> , <i>Lathyrus linifolius</i> , <i>Achillea ptarmica</i> and <i>Anemone nemorosa</i> .	134	316115	594439	Wetter hollow with much <i>Sphagnum fallax</i> plus <i>Polytrichum commune</i> , <i>Carex nigra</i> and <i>Pleurozium schreberi</i> .
113	315099	593877	Short grazed acidic grassland, wetter and more acidic (but somewhat enriched) than other pasture below with <i>Nardus stricta</i> , <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Carex panicea</i> and some <i>Trichophorum germanicum</i> .	135	316044	594463	Ridge tops with a short turf and dense patches of <i>Juncus effusus</i> , not marshy but poor draining and turf with mostly <i>Carex nigra</i> and <i>Rhynchospora squarrosus</i> (occasional <i>Sphagnum</i> relic or <i>Nardus stricta</i> ).
114	315268	594081	Relic boggy vegetation (peat c. 30cm) in level area by fence with <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Sphagnum</i> spp.	136	316090	594482	Local area of wetter mire (c. 30cm peat) with <i>Sphagnum fallax</i> plus <i>Carex nigra</i> , <i>Polytrichum commune</i> and occasional <i>Eriophorum vaginatum</i> .
115	315315	594258	Relic bog extending down gentle (drained) slope from fence with locally abundant <i>Sphagnum</i> (some <i>Aulacomnium palustre</i> ), plus <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , short <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccus</i> and <i>Drosera rotundifolia</i> .	137	316196	594580	Wetter bog with much <i>Sphagnum</i> (some <i>S. papillosum</i> ) with <i>Eriophorum</i> spp., <i>Vaccinium oxycoccus</i> , <i>Trichophorum germanicum</i> and <i>Aulacomnium palustre</i> ; spills to margins.
116	315345	594245	Bog vegetation extends up to fence with frequent <i>Sphagnum</i> but more wet heath-like.	138	316239	594593	Shallower peat (20cm) with increasingly wet heath vegetation but frequent <i>Eriophorum vaginatum</i> : <i>Sphagnum capillifolium</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , <i>Rhynchospora loreus</i> , <i>Sphagnum fallax</i> and some <i>Vaccinium vitis-idaea</i> .
117	315381	594245	Below drain a more graminoid degraded bog with much less <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; much <i>Molinia</i> with <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> and <i>Vaccinium myrtillus</i> .	139	316233	594649	Poached and degraded bog or wet heath (shallow peat) but with frequent <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; <i>Trichophorum</i> increasing with <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and short <i>Calluna vulgaris</i> .
118	315389	594331	Flushing down slope with locally much <i>Juncus effusus</i> (here with <i>Sphagnum</i> ) and some flushed acid grassland (often much <i>Molinia</i> ).	140	316154	594591	Ridge with <i>Juncus effusus</i> , mossy and poached, with some acidic relic indicators ( <i>Pleurozium schreberi</i> and <i>Sphagnum</i> spp.).
119	315536	594219	Old drain (burn) and dyke; slope above with mossy acid grass ( <i>Juncus squarrosus</i> but frequent <i>Molinia caerulea</i> ).	141	316004	594582	Better quality bog (but well drained) on peat c. 30 to 50cm; good <i>Sphagnum</i> cover (some <i>S. papillosum</i> , <i>S. cuspidatum</i> ) with <i>Vaccinium oxycoccus</i> , <i>Erica tetralix</i> , <i>Drosera rotundifolia</i> frequent; some <i>Sphagnum capillifolium</i> hummocks with <i>Polytrichum strictum</i> , <i>Vaccinium myrtillus</i> and <i>Pleurozium schreberi</i> .
120	315544	594328	Slopes with a rather complex mosaic of acid grasslands (some wet and more acidic) with bracken and <i>Juncus effusus</i> patches.	142	316049	594607	Quality bog but drained (deep peat) with <i>Vaccinium oxycoccus</i> , <i>V. vitis-idaea</i> , <i>Eriophorum angustifolium</i> , <i>Narthecium ossifragum</i> , <i>Empetrum nigrum</i> , <i>Sphagnum papillosum</i> , <i>S. cuspidatum</i> , <i>Rhynchospora loreus</i> and <i>Odontoschisma sphagni</i> .
121	315545	594349	Steep slope with local domination by <i>Juncus effusus</i> but some patches of wet short pasture (some enriched) but others with more acidic relic ( <i>Nardus stricta</i> , moss).	143	316075	594680	Bog tongue extends here (by drain), but with increasing <i>Sphagnum fallax</i> , <i>Carex nigra</i> and <i>Juncus squarrosus</i> .
122	315457	594446	Slope dominated by mix of <i>Juncus effusus</i> and bracken; above wet pasture with <i>Juncus effusus</i> (diffuse or patches).	144	315961	594738	Bog spills down here with increased <i>Juncus squarrosus</i> but still bog elements <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhynchospora loreus</i> and <i>Aulacomnium palustre</i> .
123	315567	594433	Locally more acidic wet grassland with <i>Nardus stricta</i> but also much <i>Juncus effusus</i> (diffuse or patches), but below is enriched pasture.	145	315948	594762	Poached, mossy (much <i>Calligonella cuspidata</i> ) wet pasture or rush mire about burn; more acidic to east side.
124	315728	594330	Weak ridge (by small burn) with less enriched acid grass (and bracken).				
125	315875	594464	Very wet and poached pasture with frequent <i>Juncus acutiflorus</i> .				

146	315892	594737	Very wet and poached (some stony rubble) pasture with some marshy zones (similar up to old fold).
147	315824	594719	Steepening slope with less enriched pasture (still short grazed).
148	315776	594639	Top of <i>Juncus effusus</i> flush (about drain line); pasture above less enriched.
149	315591	594655	Vague old drain line through otherwise enriched pasture down slope with local patches of bracken or <i>Juncus effusus</i> ; locally poached or flushed.
150	315530	594697	Steep slope with increased bracken but also network of <i>Juncus effusus</i> drains and flushes.
151	315425	594757	Level area supporting relic bog with much <i>Sphagnum</i> plus <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Rhytidiadelphus loreus</i> and <i>Aulacomnium palustre</i> .
152	315444	594855	Extensive slope of wet acid grassland: <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> , <i>Anthoxanthum odoratum</i> , <i>Potentilla erecta</i> , <i>Luzula campestris</i> , <i>Pleurozium schreberi</i> and occasional <i>Eriophorum vaginatum</i> .
153	315549	594821	Hill summit with mossy acidic grass turf ( <i>Carex nigra</i> and <i>Rhytidiadelphus squarrosus</i> ) plus some boggy relics ( <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Juncus squarrosus</i> and <i>Eriophorum vaginatum</i> ).
154	315620	594849	Higher quality bog relic with <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> .
155	315697	594843	Extensive upper slope with short turf but with <i>Carex nigra</i> and <i>Rhytidiadelphus squarrosus</i> in abundance with locally frequent <i>Juncus effusus</i> ; other species (scarce) include <i>Anthoxanthum odoratum</i> , <i>Luzula campestris</i> , <i>L. pilosa</i> and <i>Festuca ovina</i> , with some (rare) relics of acidic progenitors (e.g. <i>Juncus squarrosus</i> and <i>Pleurozium schreberi</i> ).
156	315711	594902	Bog becoming grassier with increased <i>Carex nigra</i> and hypnoid mosses plus <i>Polytrichum commune</i> , <i>Anthoxanthum odoratum</i> and <i>Nardus stricta</i> .
157	315601	594918	Slightly enriched ridge between bog zone with <i>Juncus effusus</i> plus <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> and some <i>Nardus stricta</i> .
158	315490	594906	Below increasing bog relics including some hummocks ( <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> ); peat not very deep.
159	315504	595002	Leveller are with wetter bog and frequent <i>Eriophorum vaginatum</i> tussocks, plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Molina caerulea</i> , <i>Carex nigra</i> , <i>Luzula multiflora</i> , <i>Sphagnum</i> (some <i>S. papillosum</i> ), <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Aulacomnium palustre</i> .
160	315624	594985	Bog with much <i>Sphagnum</i> ( <i>S. rubellum/capillifolium</i> , <i>S. fallax</i> ) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
161	315692	594987	Flushed short turf with increasing <i>Juncus acutiflorus</i> (more so below); turf enriched with <i>Ficaria verna</i> , <i>Trifolium repens</i> , <i>Ranunculus repens</i> , <i>Cardamine pratensis</i> and <i>Calliergonella cuspidata</i> .
162	315757	594966	Tussocky graminoid bog (grading to acid grassland) with frequent <i>Eriophorum vaginatum</i> plus much hypnoid mosses; frequent <i>Vaccinium myrtillus</i> , plus <i>Polytrichum commune</i> , <i>Carex nigra</i> , <i>Potentilla erecta</i> , <i>Molinia caerulea</i> and <i>Anthoxanthum odoratum</i> .
163	315773	594972	Bog vegetation (c. 30cm deep peat) with <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , <i>Sphagnum capillifolium</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Pleurozium schreberi</i> .
164	315699	595051	<i>Juncus effusus</i> common but with acid grass relics ( <i>Polytrichum commune</i> , <i>Nardus stricta</i> , <i>Carex nigra</i> and <i>Eriophorum vaginatum</i> ), grading to <i>Juncus acutiflorus</i> mire

			flushing near drain loop below.
165	315772	595073	Bog vegetation and drains feed small, but steep-sided burn valley with short grassland plus some bracken, dry heath and <i>Juncus acutiflorus</i> flushing: species include <i>Ficaria verna</i> , <i>Oxalis acetosella</i> , <i>Luzula pilosa</i> , <i>Oreopteris limbosperma</i> , <i>Conopodium majus</i> , <i>Viola palustris</i> , <i>V. riviniana</i> , <i>Equisetum palustre</i> , <i>Crepis paludosa</i> , <i>Filipendula ulmaria</i> and <i>Cirsium palustre</i> .
166	315878	594999	Mostly dry boggy vegetation (peat c. 30cm) on steep slope with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Sphagnum capillifolium</i> and <i>Rhytidiadelphus</i> spp.
167	315894	595010	Steep lower slopes with intermediate degraded bog relics and acid grassland elements (and some <i>Juncus effusus</i> patches below).
168	315992	594994	Wet track with deep ruts through a large but very wet and badly poached rush area (some very deep and with <i>Glyceria</i> ).
169	315964	595026	Short grazed pasture extends from south but here more flushed (but enriched) with short <i>Juncus acutiflorus</i> , <i>Ficaria verna</i> , <i>Ranunculus</i> spp. and <i>Carex</i> spp.
170	316029	595067	Flushed short grazed (and poached) pasture on slope below hill down to burn; <i>Juncus</i> spp., <i>Carex</i> spp., bracken and some <i>Anemone nemorosa</i> .
171	316063	594882	Leveller ground with good quality wet bog: <i>Sphagnum</i> extensive (some <i>S. papillosum</i> , <i>S. tenellum</i> , <i>S. denticulatum</i> ) plus <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Drosera rotundifolia</i> <i>Empetrum nigrum</i> , <i>Odontoschisma sphagni</i> and rare <i>Cladonia</i> lichens. Very small <i>Eriophorum angustifolium</i> - <i>Sphagnum cuspidatum</i> bog pool here.
172	316148	594820	Very long old drain on slope contour separating below a more degraded bog (wet heath like) with occasional <i>Eriophorum vaginatum</i> plus frequent <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> spp.; locally <i>Carex nigra</i> and <i>Sphagnum fallax</i> flush zones.
173	316153	594888	Embankment with several old cross drains with bog grading to wet acid grassland: <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Nardus stricta</i> and <i>Polytrichum commune</i> .
174	316194	594938	Diverse mire below embankment (some bracken) extending to burn: <i>Filipendula ulmaria</i> , <i>Succisa pratensis</i> , <i>Ajuga reptans</i> , <i>Valeriana dioica</i> , <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Crepis paludosa</i> . Burn (new planting) with short acid grass plus relic heath, plus local primrose patches.
175	316125	594984	Gentle slope to bog margin (peat c. 30+cm) with increasing quality above with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Sphagnum</i> spp.; above some <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> and <i>Eriophorum angustifolium</i> and some hummock ù hollow patterning (former with <i>Polytrichum strictum</i> ).
176	316141	595057	Wet acid grassland in transition band below bog and above burn embankment; <i>Juncus acutiflorus</i> and <i>J. effusus</i> frequent but also <i>Juncus squarrosus</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> relic.
177	316161	595075	Burn sides and area beyond with badly poached (and vehicle ruts), mostly bare ground.
178	315753	595151	Lower slopes with wet mossy grass but generally much <i>Juncus acutiflorus</i> (some short grazed though).
179	315884	595222	Broad main valley with locally diverse <i>Juncus acutiflorus</i> marsh; western side flushed and east side steeper with acid grass and some bracken.



180	315974	595266	Lower slopes with less bog relics, with abundant moss and short grazed <i>Juncus acutiflorus</i> (and more prominent <i>Juncus effusus</i> ); some <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Carex</i> spp., and mosses <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Pleurozium schreberi</i> .
181	316040	595230	Wet intermediate (and mixed) area of bog relics but grassier and tussocky ( <i>Rhytidiadelphus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and grasses) and with increasing <i>Juncus</i> spp.
182	316023	595272	Tussocky bog with <i>Eriophorum</i> spp., <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum</i> (some <i>S. papillosum</i> ) and <i>Vaccinium oxycoccos</i> .
183	315949	595294	Drained bog relics on peat c. 30+ cm, with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> and hypnoid mosses, including <i>Rhytidiadelphus loreus</i> .
184	315850	595365	Relic area of boggy vegetation ( <i>Sphagnum</i> , <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> ) but mostly wet rush mire here below the old (dilapidated) fence.
185	315828	595373	Broad valley with steep short grassland to sides (some bracken blocks) with <i>Oreopteris limbosperma</i> , <i>Primula vulgaris</i> and <i>Ficaria verna</i> ; flushed ( <i>Juncus acutiflorus</i> ) to sides of meandering water course.
186	315733	595334	<i>Juncus effusus</i> in and below drain, initially with <i>Sphagnum</i> but soon more mineral flushed (and with <i>Juncus acutiflorus</i> ).
187	315615	595287	Areas of <i>Nardus</i> grassland but also much <i>Juncus effusus</i> (by drains and extensive below).
188	315665	595326	Sparse relic <i>Eriophorum vaginatum</i> with moss (much <i>Polytrichum commune</i> ) plus some <i>Molinia</i> and <i>Calluna</i> ; peat c. 40cm.
189	315642	595374	Graminoid bog continues on slope below large drain ( <i>Juncus effusus</i> ); short heather with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> and hypnoid mosses.
190	315597	595426	Strips of wet short acid grassland (occasional bracken) with local patches of <i>Juncus effusus</i> .
191	315634	595472	Steep slope with relic, tussocky <i>Eriophorum vaginatum</i> bog with abundant <i>Polytrichum commune</i> plus <i>Rhytidiadelphus</i> spp., <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> and <i>Calluna vulgaris</i> .
192	315587	595477	Steep slope with tussocky, degraded and mossy relic bog (peat c. 30cm), with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Sphagnum</i> .
193	315609	595524	Deep drain/burn ( <i>Juncus</i> and flushing) with <i>Nardus</i> grassland (some bracken) but also areas of wet heath relics (grazed) with <i>Calluna vulgaris</i> , <i>Molinia</i> , <i>Trichophorum</i> and <i>Vaccinium myrtillus</i> .
194	315912	595429	<i>Juncus effusus</i> over moss dominated vegetation, with some <i>Digitalis purpurea</i> and <i>Cardamine flexuosa</i> ; occasional <i>Nardus stricta</i> , <i>Molinia caerulea</i> and <i>Carex nigra</i> .
195	315866	595466	Extensive wet, very mossy acid grassland mostly dominated by <i>Juncus effusus</i> ; some tussocky <i>Polytrichum commune</i> with <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Sphagnum fallax</i> and occasional short <i>Eriophorum vaginatum</i> , but rare ericoids.
196	315848	595480	Boggy vegetation below (peat c. 40cm) with <i>Trichophorum</i> , <i>Molinia</i> , <i>Calluna</i> , <i>Polygala serpyllifolia</i> , <i>Potentilla erecta</i> , <i>Erica tetralix</i> , <i>Sphagnum</i> , <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> .
197	315831	595503	<i>Juncus effusus</i> tending to dominate with much moss, <i>Cirsium palustre</i> , local <i>J. acutiflorus</i> and <i>Molinia caerulea</i> , but also frequent <i>Digitalis purpurea</i> and <i>Cardamine</i>

			<i>flexuosa</i> (disturbance?). Above (near peaty relics) <i>Juncus effusus</i> with some <i>Sphagnum</i> .
198	315808	595497	Slight ridge with mosaic of <i>Juncus effusus</i> and wet acidic grassland elements ( <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> , <i>Nardus stricta</i> and some <i>Molinia caerulea</i> ).
199	315901	595582	<i>Juncus effusus</i> dominating but not marshy and with much <i>Rhytidiadelphus squarrosus</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> .
200	315842	595587	Extensive wet acid grassland with much <i>Juncus effusus</i> : <i>Carex nigra</i> , and <i>Rhytidiadelphus squarrosus</i> , plus <i>Anthoxanthum odoratum</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> and some <i>Molinia caerulea</i> .
201	315752	595603	Tussocky wet moss ( <i>Polytrichum commune</i> , hypnoid mosses, occasional <i>Sphagnum</i> ) with frequent <i>Juncus effusus</i>
202	315651	595658	Steep valley side with some patches of dry heath and bracken, otherwise short grassland (some flushed) and below occasional <i>Juncus effusus</i> stand.
203	315685	595689	Contrast to south of fence with short grazed tussocky <i>Polytrichum commune</i> with hypnoid mosses and some <i>Sphagnum</i> (below), but some short ericoids, and local <i>Vaccinium oxycoccos</i> .
204	315823	595682	<i>Nardus</i> grassland but with some wet heath elements ( <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Molinia</i> <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> ); <i>Juncus effusus</i> frequent too dense nearby.
205	315991	595699	Small ellipse of relic wet bog (mire like) with much <i>Sphagnum</i> ( <i>S. fallax</i> and <i>S. capillifolium</i> ) plus <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> and <i>Eriophorum</i> spp.
206	316203	595322	Very deep drain with steep bank below ( <i>Nardus stricta</i> ); below broad short grassland with occasional <i>Juncus effusus</i> patches.
207	316120	595608	Wetter area of <i>Juncus effusus</i> with <i>Carex nigra</i> plus some <i>Sphagnum</i> and occasional <i>Eriophorum vaginatum</i> .
208	316170	595652	Slope with <i>Juncus effusus</i> prominent but also much <i>Carex nigra</i> and moss; some relic <i>Nardus stricta</i> and <i>Molinia caerulea</i> .
209	316214	595739	U-shaped valley with acid grassland to base plus occasional <i>Juncus</i> flushes or patches; west side crenellated with local bracken plus occasional <i>Oreopteris limbosperma</i> , <i>Digitalis purpurea</i> or rare hawthorn; other herbs include <i>Primula vulgaris</i> , <i>Oxalis acetosella</i> , <i>Viola palustris</i> and <i>Luzula pilosa</i> .
210	316156	595748	Broad ledge between slope and valley with much <i>Juncus</i> (to slope bottom) but also relic graminoid bog, drained and tussocky, with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> plus <i>Molinia</i> , <i>Juncus squarrosus</i> and occasional <i>Trichophorum</i> and <i>Erica tetralix</i> .
211	315951	595843	Fence provides sharp contrast between bog to north and wet acid grassland (with rush) to south; here some bog elements spill over with <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> .
212	316000	595848	Slope with increasing <i>Juncus effusus</i> plus <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> and rare to occasional <i>Eriophorum vaginatum</i> .
213	316111	595886	Relic area of tussock graminoid bog ( <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> , <i>Polytrichum commune</i> ) but grading to <i>Juncus</i> above drains and flushes.
214	314545	595556	Side of hill with old drain ( <i>Juncus effusus</i> ) and slight erosion slip; below acid grass locally with more bracken.
215	314495	595659	Steep sided burn with some erosion areas (often with <i>Epilobium brunnescens</i> ); wet acid grassland with bracken and flushes, with <i>Chrysosplenium oppositifolium</i> , <i>Stellaria alsine</i> , <i>Ranunculus</i> spp., <i>Myosotis secunda</i> , <i>Cardamine amara</i> , <i>Lysimachia nemorum</i> and <i>Veronica beccabunga</i> .

216	314566	595721	Slope here with increased <i>Molinia caerulea</i> (but still <i>Juncus acutiflorus</i> ), tussocky with wet acid grassland.
217	314573	595900	Small spring with <i>Philonotis</i> sp., <i>Palustriella falcata</i> and local <i>Briza media</i> ; <i>Juncus acutiflorus</i> and <i>Molinia caerulea</i> dominated flushed slopes.
218	314523	596020	Short-grazed, flushed but enriched grassland feeding small burn; short <i>Cynosurus cristatus</i> , <i>Trifolium repens</i> , <i>Ranunculus acris</i> , <i>Cardamine pratensis</i> , <i>Carex</i> spp., and <i>Caliergonella cuspidata</i> .
219	314747	596176	Steep sided drain or burn (scoured) with frequent <i>Juncus effusus</i> (some broader patches) but also acid grassland and bracken; <i>Juncus effusus</i> broader to top of valley above.
220	314745	595781	<i>Molinia</i> extensive with <i>Nardus stricta</i> , <i>Potentilla erecta</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Pleurozium schreberi</i> and occasional <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> plus (some small <i>Juncus effusus</i> and short pasture patches).
221	314813	595783	Slope below fence with tussocky <i>Eriophorum vaginatum</i> grading to tussocky <i>Molinia caerulea</i> (but with some <i>Trichophorum germanicum</i> and <i>Vaccinium myrtillus</i> indicating wet heath link).
222	314781	595719	<i>Molinia caerulea</i> common (tussocky) with a grassier appearance (few heath links).
223	314758	595677	<i>Molinia caerulea</i> common but grassy and with some wet heath elements.
224	314782	595481	Drains through bog relic; bog with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> plus <i>Sphagnum</i> spp (some <i>S. papillosum</i> ), <i>Polytrichum commune</i> and <i>Rhytidiadelphus loreus</i> .
225	314818	595522	Up the slope (from bog below) vegetation with a graminoid wet heath appearance with <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> and various mosses.
226	314857	595579	Further up slope Ns increases but also occasional relic <i>Eriophorum vaginatum</i> . Short bryophytes seem diverse with <i>Dicranum scoparium</i> , <i>Campylopus flexuosus</i> , <i>Ptilidium ciliare</i> , <i>Barbilophozia attenuata</i> etc.
227	314883	595617	Relic area of <i>Eriophorum vaginatum</i> with <i>Polytrichum commune</i> and <i>Sphagnum</i> , plus <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , in slight depression.
228	314927	595520	<i>Juncus acutiflorus</i> flush, very mossy (little <i>Sphagnum</i> ) with some <i>Cardamine pratensis</i> and <i>Cirsium palustre</i> . Frequent old drain lines some with <i>Juncus effusus</i> and <i>Sphagnum</i> , but others flushed <i>Juncus acutiflorus</i> .
229	315053	595523	Wet grassland with graminoid <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> bog relics, with several deep drains.
230	315110	595534	Relic graminoid bog (peat > 50cm) with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Agrostis canina</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> spp and hypnoid mosses.
231	315186	595578	Marshy grassland with drains and some cells of relic bog ( <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> spp).
232	315028	595598	Old contouring drain with strip of relic bog like mire ( <i>Sphagnum fallax</i> but with <i>Eriophorum vaginatum</i> ); below wet grassland with frequent <i>Molinia caerulea</i> and <i>Carex nigra</i> but also some heath elements ( <i>Vaccinium myrtillus</i> ).
233	315047	595708	Lower slopes with poorly draining wet acidic grassland and some relics of former bog; <i>Molinia caerulea</i> is common but with various wet heath elements ( <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> ) and frequent <i>Carex nigra</i> .
234	315186	595727	Steep slope with some relic <i>Eriophorum vaginatum</i> but also wet heath elements ( <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> ) in various amounts; mosses include <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and <i>Polytrichum commune</i> .

235	315123	595866	Intermediate relic bog or graminoid wet heath on slope (peat c. 20cm deep); <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , mosses ( <i>Sphagnum fallax</i> , <i>S. capillifolium</i> , <i>Pleurozium</i> , <i>Rhytidiadelphus loreus</i> ) and occasional <i>Juncus squarrosus</i> and <i>Trichophorum germanicum</i> .
236	315086	595999	Very steep slope with graminoid relics of wet heath or bog vegetation ( <i>Molinia</i> , <i>Polytrichum commune</i> , <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> and <i>Sphagnum capillifolium</i> ).
237	314879	595965	Bog spill but only limited <i>Eriophorum vaginatum</i> (plus <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> ).
238	314994	596026	<i>Eriophorum vaginatum</i> frequent (peat c. 25cm) but with wet acid grassland and some wet heath elements ( <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and mosses).
239	314946	596057	Wet acid grassland with some wet heath or bog relics but hard to demarcate: <i>Nardus stricta</i> with <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> plus some <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> .
240	315058	596132	Drained cells of relic (but modified) graminoid bog (peat 40+ cm): tussocky <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> lawns (plus <i>Juncus squarrosus</i> and <i>Carex nigra</i> ).
241	314976	596149	Steep slope above <i>Juncus</i> lined flush with acid grass grading to bog relic ( <i>Eriophorum vaginatum</i> with <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> ).
242	314937	596237	Wet bog with much <i>Sphagnum</i> ( <i>S. fallax</i> , <i>S. capillifolium</i> , and rare <i>S. papillosum</i> ) at fence corner; with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Rhytidiadelphus loreus</i> and <i>Polytrichum commune</i> .
243	314999	596276	Gentle slope with drying bog (peat c. 25cm) with sparse <i>Eriophorum vaginatum</i> plus wet heath indicators (more so to south) <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and various mosses.
244	315080	596251	East side of burn with drained ( <i>Juncus effusus</i> lines) cells of modified bog <i>Juncus squarrosus</i> frequent (some short <i>Eriophorum vaginatum</i> ), <i>Carex nigra</i> , with <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> , and some <i>Vaccinium oxycoccos</i> .
245	315216	596392	Narrow flush below <i>Juncus effusus</i> patch with <i>Carex nigra</i> or <i>Juncus squarrosus</i> in otherwise extensive <i>Nardus stricta</i> grassland: associates include <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula pilosa</i> , <i>Carex binervis</i> , rare <i>Trichophorum germanicum</i> or <i>Molinia caerulea</i> and various mosses.
246	315254	596384	Curious ridges and hollows patterning with former supporting <i>Nardus stricta</i> and wetter <i>Juncus squarrosus</i> acid grassland.
247	315283	596288	Wetter flush line with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Carex nigra</i> and <i>Juncus effusus</i> ; margins with increased <i>Juncus squarrosus</i> but soon Ns type grassland.
248	315361	596376	Saddle area to top of shallow valley with relic boggy vegetation but dominated by <i>Juncus squarrosus</i> with <i>Sphagnum</i> but seemingly little or no <i>Eriophorum vaginatum</i> .
249	315573	596498	Wetter flushing marked by increasing <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> ; locally boggy (peat 30cm) with some <i>Sphagnum papillosum</i> and rare <i>Eriophorum vaginatum</i> .
250	315673	596585	Very large area of wet <i>Sphagnum fallax</i> dominated mire with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> ; grading relic bog at margins but soon wet acid grassland up slope.



251	315623	596236	Extensive short-grazed wet grassland (drained) with much <i>Rhytidiadelphus squarrosus</i> and <i>Juncus acutiflorus</i> ; occasional <i>Polytrichum commune</i> and <i>Juncus squarrosus</i> .	271	315588	595660	Leveller area with wetter, deeper peat, <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> and <i>Calluna vulgaris</i> .
252	315557	596229	Steep slope (peat c. 30cm) dominated by short moss: much <i>Polytrichum commune</i> with <i>Sphagnum</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus</i> spp., plus <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , short <i>Calluna</i> and some <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> .	272	315591	595689	Feeder valley with <i>Juncus acutiflorus</i> flushing with some freer draining acid grass ( <i>Nardus</i> ); <i>Ajuga reptans</i> frequent with <i>Cirsium palustre</i> , <i>Luzula pilosa</i> and some ferns.
253	315676	596188	Strip of wet heath to west side fence above small burn; west side with <i>Nardus</i> grassland.	273	315671	595721	Slope with graminoid tussocky <i>Eriophorum vaginatum</i> plus <i>Sphagnum</i> spp., <i>Polytrichum commune</i> and some <i>Calluna vulgaris</i> , <i>Erica tetralix</i> and <i>Trichophorum germanicum</i> (hummocks with <i>Vaccinium myrtillus</i> , <i>Sphagnum capillifolium</i> and <i>Polytrichum strictum</i> ).
254	315507	596108	Extensive slope with short grazed, but tussocky, bog vegetation (peat c. 20cm); some <i>Eriophorum vaginatum</i> with much <i>Polytrichum commune</i> plus <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> (short), and mosses include <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> , <i>Hylocomium splendens</i> and <i>Sphagnum</i> .	274	315690	595830	Extensive wet heath (peat c. 30cm) with <i>Calluna vulgaris</i> frequent but also much <i>Juncus squarrosus</i> plus <i>Polytrichum commune</i> and <i>Sphagnum</i> .
255	315364	596129	<i>Juncus squarrosus</i> acid grassland with some bog elements, usually linked to spills or flushing from boggy relics.	275	315697	595921	Slope here with increasing ericoids plus <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Sphagnum</i>
256	315366	596067	Leveller area with very wet boggy more (often much <i>Sphagnum fallax</i> ) with <i>S. capillifolium</i> , <i>Juncus squarrosus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> and some <i>Eriophorum vaginatum</i> .	276	315645	595954	Burn here with broad <i>Juncus acutiflorus</i> flush (with <i>Ajuga</i> , <i>Ficaria verna</i> , <i>Ranunculus repens</i> ) and steeper sides free draining with acid grass ( <i>Nardus</i> ) plus occasional fern.
257	315288	596135	Wetter flush with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Carex nigra</i> and some <i>Juncus effusus</i> patches.	277	315693	595959	<i>Juncus effusus</i> (and <i>Sphagnum</i> ) drain marks boundary of steep slope with bog below; latter on slope with increasing <i>Molinia</i> and <i>Eriophorum</i> .
258	315245	596066	Local cells of <i>Juncus squarrosus</i> wet acid grassland (relic bog).	278	315731	596011	Extensive slope of <i>Nardus stricta</i> grassland locally wet with <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , <i>Anthoxanthum odoratum</i> , <i>Vaccinium myrtillus</i> , <i>Luzula</i> spp., <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Polytrichum commune</i> .
259	315187	596043	Near burn short-grazed, very wet mossy grassland (much <i>Rhytidiadelphus squarrosus</i> ), in cells form by <i>Juncus effusus</i> drain.	279	315686	596078	Bog wetter here: <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum</i> (but <i>S. papillosum</i> absent), <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> and <i>Polytrichum commune</i> .
260	315225	595925	Central burn with <i>Juncus</i> spp.-dominated flushing; sides with acid grassland but also flushed from above; <i>Nardus</i> locally frequent on slopes.	280	315703	596144	Bog becoming drier with much <i>Eriophorum vaginatum</i> but still plenty of <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Erica tetralix</i> and <i>Molinia caerulea</i> .
261	315278	595919	Gentle slope to east of burn with similar wet, drained acid grassland, but more acidic locally (some deep peat – with <i>Molinia</i> , <i>Juncus squarrosus</i> ).	281	315839	596171	Ground leveller supporting wetter bog with abundant <i>Sphagnum</i> cover (some <i>S. papillosum</i> and <i>S. cuspidatum</i> ) plus <i>Polytrichum strictum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> and some <i>Erica tetralix</i> and <i>Vaccinium oxycoccos</i> .
262	315207	595863	Broad open valley with extensive cover of short grazed, very wet, moss dominated grassland with much rush ( <i>Juncus effusus</i> prominent, but <i>J. acutiflorus</i> short grazed)	282	315854	596072	Graminoid tussocky bog (peat c. 30 cm) <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> to hummocks with between <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> and some <i>Molinia caerulea</i> .
263	315301	595835	Vegetation boggier with <i>Juncus squarrosus</i> plus <i>Trichophorum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> etc.	283	315853	595984	Summit ridge of scattered <i>Juncus effusus</i> in wet acid grassland: <i>Rhytidiadelphus squarrosus</i> common with <i>Carex nigra</i> plus <i>Anthoxanthum odoratum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Galium saxatile</i> and occasional relic <i>Eriophorum vaginatum</i> .
264	315463	595892	Mosaic of wet <i>Nardus</i> grassland and <i>Juncus effusus</i> 'marsh'; latter often associated with old drains and some diffuse flushing.	284	315860	595898	Wet bog on leveller ground (peat 40+ cm) ( <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> and <i>S. capillifolium</i> plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> and <i>Aulacomnium palustre</i> ).
265	315243	595693	Slump of more acidic wet acid grassland (with <i>Juncus squarrosus</i> , <i>Nardus stricta</i> and <i>Molinia</i> , plus <i>Sphagnum</i> and occasional short heather).	285	315969	595900	Slope with drying bog (increased <i>Eriophorum vaginatum</i> but less <i>Sphagnum</i> ) plus <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and occasional <i>Calluna vulgaris</i> or <i>Molinia caerulea</i> .
266	315239	595656	Short grazed flushes below fence with local high diversity: <i>Carex</i> spp., various short herbs (some <i>Ajuga reptans</i> ) and abundant mosses include some <i>Ctenidium molluscum</i> and <i>Climacium dendroides</i> .	286	316016	596006	Series of big old cross drains; below bog is more wet heath like with increased <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Calluna vulgaris</i> .
267	315289	595571	Mosaic of wet ,short grazed, often moss dominated, marshy grassland but with some relic areas with bog (or wet heath) relics.	287	315934	596117	Wetter bog (some <i>Sphagnum papillosum</i> ) but with <i>Eriophorum vaginatum</i> domination (but some <i>Calluna vulgaris</i> and <i>Erica tetralix</i> ).
268	315428	595715	Some ericoids but very graminoid and mossy (peat c. 40cm); some <i>Vaccinium oxycoccos</i> .	288	316104	595997	Feeder valley with some <i>Nardus</i> to side, and <i>Juncus</i> flushing, with some wet <i>Eriophorum vaginatum</i> (with <i>Sphagnum</i> and <i>Polytrichum commune</i> ).
269	315506	595744	Deeper peat (c. 50cm), but drained and very mossy, with relic bog elements: <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Potentilla erecta</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Rhytidiadelphus loreus</i> and some <i>Polytrichum strictum</i> hummocks.	289	316091	596050	Graminoid bog relic on gentle slope (drained) with increased <i>Polytrichum commune</i>
270	315543	595712	Sloping towards burn with drained, short-grazed, wet moss dominated 'marshy grassland' with abundant <i>Juncus acutiflorus</i> , plus <i>Molinia</i> , <i>Carex</i> spp., <i>Nardus stricta</i> , <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> .				

			and <i>Molinia caerulea</i> .
290	316082	596104	Deep <i>Juncus effusus</i> drain (with <i>Sphagnum</i> ) through wet graminoid bog.
291	316050	596111	Broad <i>Juncus effusus</i> strip, and drain, (some with <i>Sphagnum</i> ) below steep slope.
292	316026	596114	Steep slope here with increased <i>Molinia</i> and some <i>Juncus squarrosus</i> ; to north <i>Eriophorum vaginatum</i> increases with usual associates: <i>Molinia</i> , <i>Vaccinium myrtillus</i> , occasional <i>Calluna vulgaris</i> or <i>Erica tetralix</i> , rare <i>Vaccinium vitis-idaea</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Sphagnum fallax</i> .
293	316022	596116	Lower slope with a more wet heath like vegetation (frequent <i>Molinia caerulea</i> ) but with ericoids and often bog element where seepage from bog above.
294	316101	596161	Locally increased <i>Molinia</i> (on deep peat) with some <i>Trichophorum germanicum</i> (and <i>Eriophorum</i> bog elements), and to drains <i>Juncus effusus</i> .
295	316023	596169	Local <i>Nardus stricta</i> or <i>Juncus squarrosus</i> on steep sections but also much flushing (with <i>Carex nigra</i> , <i>C. echinata</i> , <i>Agrostis canina</i> ) merging with <i>Juncus effusus</i> zones to old drains.
296	316115	596225	Heather (with <i>Molinia</i> ) prominent over fence above burn; actual burnside with new broad-leaved planting.
297	316020	596223	Mixed area with common or scarce <i>Eriophorum</i> plus local <i>Molinia</i> and <i>Juncus squarrosus</i> , plus <i>Nardus stricta</i> , <i>Potentilla erecta</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> , <i>Carex nigra</i> and <i>Calluna vulgaris</i> .
298	315917	596238	Below bog becoming drier with much <i>Eriophorum vaginatum</i> but frequent <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> (recovering?) plus <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> and <i>Juncus squarrosus</i> .
299	315975	596267	Grassy wet heath up slope, frequent <i>Nardus stricta</i> with prominent <i>Molinia</i> , but also <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> , <i>Erica tetralix</i> , <i>Polytrichum commune</i> and <i>Sphagnum rubellum</i> .
300	315910	596286	Wet boggy vegetation (peat c. 40cm) with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Eriophorum angustifolium</i> , <i>Potentilla erecta</i> , <i>Sphagnum fallax</i> , <i>S. rubellum</i> and <i>Polytrichum commune</i> .
301	315817	596332	Level ground with good <i>Sphagnum</i> cover (some <i>S. papillosum</i> ).
302	315969	596377	Mostly graminoid wet heath on slope with frequent <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> but also <i>Carex nigra</i> , <i>Juncus squarrosus</i> and <i>Nardus stricta</i> (grading to wet acid grassland).
303	316037	596315	Wet bog <i>Eriophorum vaginatum</i> dominated but with thick <i>Sphagnum</i> carpet plus, <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> .
304	316056	596555	High ridge with acid grass and <i>Juncus effusus</i> about drains, and several peat edges (bog more disturbed and degraded).
305	316029	596440	<i>Juncus effusus</i> mire with some mineral elements ( <i>Rumex acetosa</i> , <i>Galium saxatile</i> , <i>Ranunculus repens</i> , <i>Rhytidadelphus squarrosus</i> , <i>Pseudoscleropodium purum</i> ).
306	316137	596507	Peat edges with below broad crescent of <i>Juncus acutiflorus</i> with <i>Sphagnum</i> marsh.
307	316134	596546	Drain with locally much <i>Juncus acutiflorus</i> with <i>Sphagnum</i> but also tussocky bog relics.
308	316185	596614	Local drains and acid grass nearer burn, but above graminoid bog with <i>Eriophorum vaginatum</i> plus <i>Molinia</i> , <i>Agrostis canina</i> , <i>Carex nigra</i> , occasional heather, much <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> plus <i>Pleurozium schreberi</i> .
309	316097	596339	Leveller ground with wetter bog with much <i>Sphagnum</i> (no <i>S. papillosum</i> noted) and <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> , <i>Calluna vulgaris</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> and some <i>Polytrichum strictum</i> hummocks.
310	315871	596515	Wet acid grassland with much <i>Carex nigra</i> and <i>Molinia caerulea</i> .

311	315748	596471	Wet bog with much <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> (occasional <i>S. papillosum</i> ) plus <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> .
312	315784	596597	Slopes below ridge with mineral flushed <i>Juncus acutiflorus</i> with <i>Filipendula ulmaria</i> , <i>Lathyrus pratensis</i> , <i>Ranunculus acris</i> , <i>Rumex acetosa</i> , <i>Lysimachia nemorum</i> and mosses.
313	316079	596661	Graminoid bog invaded by <i>Juncus acutiflorus</i> with much <i>Polytrichum commune</i> , <i>Rumex acetosa</i> , <i>Rhytidadelphus squarrosus</i> but some <i>Sphagnum palustre</i> .
314	316050	596727	Wet and diverse bog on level ground with some <i>Sphagnum papillosum</i> and <i>S. cuspidatum</i> , <i>Vaccinium oxycoccos</i> and <i>Aulacomnium palustre</i> .
315	315957	596774	Rising ground with peat edges and more degraded <i>Eriophorum vaginatum</i> bog; local ridge with acid grass.
316	315895	596821	Rising ground with increasing <i>Nardus stricta</i> and <i>Juncus squarrosus</i> , plus occasional <i>Calluna vulgaris</i> or <i>Trichophorum germanicum</i> ; valley below with some <i>Juncus mire</i> or acid grassland (and new broad-leaved planting).
317	315924	596787	Short grazed intermediate vegetation, very mossy, with some <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhytidadelphus loreus</i> , but also <i>Nardus stricta</i> and <i>Juncus squarrosus</i> and local heather (wet heath affinities).
318	315852	596859	Slope down to boggy mire below with intermediate relic bog ( <i>Eriophorum vaginatum</i> ), diffuse or in patches, with wet acid grassland and some wet heath elements ( <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> ).
319	315719	596762	Boggy relic but with much <i>Juncus squarrosus</i> plus <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Rhytidadelphus loreus</i> and <i>Sphagnum</i> spp.
320	315594	596702	Tussocky wet (and peaty c. 20cm) acid grassland with bog elements but seemingly little or no <i>Eriophorum vaginatum</i> ; <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> and <i>Sphagnum</i> spp.
321	315625	596797	Mixed area of relic bog elements (but seemingly little <i>Eriophorum vaginatum</i> though tussocky) with wet acid grassland species; difficult to classify.
322	315529	596908	Spill of bog vegetation (peat c. 25cm) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> and <i>Polytrichum commune</i> .
323	315501	596964	Bog spill down slope with increasing acid grassland or flushed mire elements, more so to south side where <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , occasional <i>Eriophorum vaginatum</i> and <i>Trichophorum germanicum</i> , plus increasing <i>Rhytidadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> and <i>Nardus stricta</i> .
324	315343	596976	Short grazed bog (peat 35cm) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> and <i>Rhytidadelphus loreus</i> .
325	315387	596759	Graminoid bog relic (up to 30cm deep peat), short grazed, with <i>Juncus squarrosus</i> but some <i>Eriophorum vaginatum</i> , plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , short <i>Calluna vulgaris</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum</i> spp., <i>Rhytidadelphus loreus</i> and other bryophytes include <i>Ptilidium ciliare</i> , <i>Campylopus</i> sp., <i>Dicranum scoparium</i> and <i>Barbilophozia</i> sp.
326	315075	596461	Low-lying valley mire but recently, and deeply, drained but retaining a good, if short (grazed) <i>Sphagnum</i> carpet: <i>S. fallax</i> , <i>S. capillifolium</i> , <i>S. papillosum</i> and <i>S. cuspidatum</i> with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium myrtillus</i> , <i>V. oxycoccos</i> , <i>Drosera rotundifolia</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> .



326	315252	596754	Extensive cover of <i>Juncus effusus</i> but with mostly acid grassland associates ( <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Rhytidadelphus squarrosus</i> ); occasional glades of <i>Nardus</i> grassland.
327	315272	596573	Mosaic of <i>Juncus effusus</i> and <i>Nardus stricta</i> dominated zones (and much intermediate), plus occasional wetter zone with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> and <i>Polytrichum commune</i> .
328	315164	596479	Lower slope with wet <i>Juncus squarrosus</i> grassland, with some <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Sphagnum capillifolium</i> and <i>Polytrichum commune</i> but further up <i>Nardus stricta</i> increasing as drainage improves (but some wetter areas above flushed from bog spills above).
330	315096	596523	Deep (3m) canalised drain through valley mire with peaty spoil supporting <i>Juncus effusus</i> to west margins.
331	315102	596642	East side of valley mire with good cover of <i>Sphagnum</i> spp., plus short grazed <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium oxycoccus</i> etc.
332	315046	596699	Bog continues to west side but becoming drier or enriched with increased <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> .
333	314967	596849	Bog spill with wet <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Narthecium ossifragum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidadelphus loreus</i> and <i>Sphagnum</i> spp.; grading to wet <i>Juncus</i> mire below.
334	314960	596563	East facing slope with extensive cover of graminoid wet heath (and degraded bog) with <i>Juncus squarrosus</i> with <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> , plus <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> .
335	314792	596798	Steep slope with acid grassland but much <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Festuca ovina</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> , some <i>Vaccinium myrtillus</i> , and mosses include <i>Rhytidadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberii</i> and <i>Polytrichum commune</i> .
336	314510	596672	Shallow valley poorly draining with wet marshy grassland, grading to <i>Juncus effusus</i> mire (with <i>Sphagnum</i> ) to north and south; slope to west with relic acid grassland ( <i>Molinia</i> , <i>Juncus squarrosus</i> , <i>Nardus</i> ) but also some enrichment indicators ( <i>Trifolium repens</i> , <i>Plantago lanceolata</i> ).
337	314512	596772	Low-lying area of <i>Juncus acutiflorus</i> mire with some <i>Sphagnum</i> ( <i>S. denticulatum</i> , and <i>S. palustre</i> ) and other mosses (some <i>Calliargon cordifolium</i> ), plus <i>Galium palustre</i> , <i>Cardamine pratensis</i> , <i>Rumex acetosa</i> , <i>Stellaria alsine</i> , <i>Cirsium palustre</i> and <i>Myosotis secunda</i> .
338	314602	596918	<i>Juncus acutiflorus</i> flush (and drain) down slope, through acid grass with scattered bracken; species include <i>Ranunculus</i> spp., <i>Cardamine pratensis</i> and <i>Galium palustre</i> .
339	314900	597081	<i>Juncus squarrosus</i> grassland with few bog relics (some <i>Sphagnum capillifolium</i> ): <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Nardus stricta</i> , <i>Carex nigra</i> and <i>Luzula multiflora</i> .
340	315109	597174	Steep sided gorges with loose stones but short grazed sides with seemingly very few herbs (rare <i>Viola riviniana</i> ).
341	315391	597159	Tussocky blanket bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>S. papillosum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidadelphus loreus</i> , <i>Pleurozium schreberii</i> and <i>Polytrichum</i> spp. Some drier areas (M20b) but others wetter (M18-like).
342	315391	597208	Plateau bog with tussocky graminoid vegetation: <i>Eriophorum vaginatum</i> hummocks with <i>Vaccinium myrtillus</i> and some <i>Calluna vulgaris</i> plus <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , (some <i>S. papillosum</i> ), <i>Rhytidadelphus loreus</i> and <i>Polytrichum</i> spp.

343	315447	597140	Intermediate boggy grassland with persisting <i>Eriophorum vaginatum</i> tussocks (some moribund) with much <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula multiflora</i> , <i>Rhytidadelphus squarrosus</i> and occasional <i>Sphagnum</i> .
344	315531	597032	Tussocky acid grassland with tussocky, spaced, <i>Nardus stricta</i> plus <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula multiflora</i> , <i>Potentilla erecta</i> , <i>Rhytidadelphus squarrosus</i> but also graminoid wet heath elements ( <i>Trichophorum</i> , <i>Molinia</i> ) and some modified bog relics ( <i>Eriophorum vaginatum</i> , <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Sphagnum</i> ).
345	315682	596978	Bog spill into mire (with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> etc).
346	315844	596981	Series of deep drains or gullies through mostly <i>Juncus acutiflorus</i> but boggy with <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> ; drier ridges with acid grassland.
347	315847	597080	Extensive <i>Juncus acutiflorus</i> but mosaic of wetter marsh areas and more intermediate wet acid grassland (some <i>Deschampsia cespitosa</i> ).
348	315714	597115	Boggy vegetation with <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , occasional <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> , with <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.
349	315557	597196	Extensive, intermediate flushed grassland with only a little <i>Eriophorum vaginatum</i> (and even rarer <i>Sphagnum</i> ) but with much <i>Carex nigra</i> plus <i>Rhytidadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> , <i>Galium saxatile</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and <i>Pleurozium schreberi</i> .
350	315613	597238	Local areas of increased <i>Eriophorum vaginatum</i> with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> and <i>Sphagnum</i> .
351	315788	597253	Old dyke ridge marked by acid grassland through marshy ground; above less acidic grassland on slope but also some patches of <i>Nardus stricta</i> .
352	315800	597386	Some marked acid grassland ridges and <i>Juncus acutiflorus</i> gullies feeding the burn valley; rush extends up slope but locally intermediate with relic <i>Eriophorum vaginatum</i> tussocks.
353	315614	597330	Rather monotonous slope of drying (but flushed) bog (peat c. 25cm) with sparse <i>Eriophorum vaginatum</i> ; <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Galium saxatile</i> , <i>Rhytidadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and local <i>Sphagnum</i> .
354	315473	597280	Wet flushed grassland with much <i>Carex nigra</i> with <i>Nardus stricta</i> (seemingly little), <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Galium saxatile</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> and <i>Rhytidadelphus squarrosus</i> .
355	315523	597399	Drying bog vegetation (peat c. 30cm) with <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Anthoxanthum odoratum</i> , <i>Carex nigra</i> , <i>Rhytidadelphus squarrosus</i> , <i>Polytrichum commune</i> and frequent <i>Sphagnum</i> .
356	315546	597435	Small <i>Carex nigra</i> - <i>Sphagnum</i> flushes (feeding <i>Juncus effusus</i> zones below) but <i>Eriophorum vaginatum</i> sparse with appearing as flushed wet grassland with much <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Sphagnum capillifolium</i> .
357	315338	597306	Bog with scattered but frequent tight hummocks ( <i>Sphagnum capillifolium</i> , <i>Polytrichum strictum</i> and some <i>S. papillosum</i> ).
358	315292	597338	Bog spill down slope but becoming increasingly grassy (much intermediate) with some tussocks (moribund <i>Eriophorum vaginatum</i> , and a little <i>Sphagnum</i> ) but with much <i>Carex nigra</i> , plus <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> and <i>Rhytidadelphus squarrosus</i> .

359	315365	597423	Leveller area with good bog vegetation with often vague and arbitrary edges (i.e. to dry modified bog); <i>Eriophorum vaginatum</i> with <i>Calluna vulgaris</i> plus <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , some <i>Narthecium ossifragum</i> , and <i>Sphagnum</i> (some <i>S. papillosum</i> ) and <i>Rhytidiadelphus loreus</i> .	375	315398	597565	Very small, open water pool with <i>Warnstorffia fluitans</i> .
360	315290	597411	Wet intermediate flushed boggy grassland, difficult to classify, with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> and <i>Nardus stricta</i> plus <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Anthoxanthum odoratum</i> .	376	315706	597533	Lower slopes flushed and very short grazed with diverse sedges ( <i>Carex panicea</i> plus <i>C. pulicaris</i> , <i>C. caryophylla</i> , <i>C. leporina</i> ) and short herbs include <i>Scorzonera autumnalis</i> , <i>Plantago lanceolata</i> , <i>Viola riviniana</i> , <i>Bellis perennis</i> , <i>Lotus corniculatus</i> and some <i>Thymus polytrichus</i> .
361	315019	597304	Sloping ground with varying flushed acid grassland (generally much <i>Carex nigra</i> ); above some <i>Juncus squarrosus</i> zones but others with some <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> but all with a graminoid appearance.	377	315717	597603	Bog on slope with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> (possibly recovering), <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , occasional <i>Trichophorum germanicum</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum</i> spp. (but latter mostly to flushes).
362	314893	597300	Leveller area with relic bog vegetation locally with good <i>Sphagnum</i> cover (some <i>S. papillosum</i> ); <i>Eriophorum vaginatum</i> with short <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Eriophorum angustifolium</i> , <i>Trichophorum germanicum</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> . Becoming drier on sloping ground (above or below).	378	315834	597691	Drained bog but much <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> plus <i>Polytrichum commune</i> , pleurocarp mosses, <i>Deschampsia flexuosa</i> , <i>Agrostis canina</i> , <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> .
363	314861	597302	Very wet area of <i>Sphagnum</i> ( <i>fallax</i> ) carpet with <i>S. papillosum</i> , <i>Narthecium ossifragum</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> .	379	315848	597726	Deep gully with <i>Juncus acutiflorus</i> (some <i>Sphagnum</i> ); adjacent ground to north intermediate bog and <i>Juncus mire</i> .
364	314926	597345	A couple of wet <i>Sphagnum fallax</i> dominated flushes (heading west to fence); with <i>Carex nigra</i> , some <i>Eriophorum vaginatum</i> or <i>Juncus squarrosus</i> , and <i>Polytrichum commune</i> .	380	315840	597763	Mixed area of mossy and tussocky acid grassland (increased <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> ), but some relic bog or wet heath elements.
365	314871	597366	Top of small valley feeder with <i>Juncus effusus</i> ; small population of <i>Ranunculus omiophyllus</i> just outside.	381	315834	597838	Steep spur with small patch of heath (quite wet) but otherwise acid grassland or below <i>Juncus</i> flushing.
366	314874	597426	Leveller area with much <i>Juncus effusus</i> with acid grass, locally more acidic (with <i>Juncus squarrosus</i> and some <i>Sphagnum</i> ) in area between old and new fences.	382	315768	598024	Mostly <i>Nardus</i> acid grassland but locally <i>Juncus acutiflorus</i> marking wetter flushing, and some areas of less acidic pasture.
367	314946	597548	Patch of leveller ground supporting relic bog (peat c. 30cm); <i>Eriophorum vaginatum</i> frequent.	383	315754	598076	<i>Eriophorum vaginatum</i> graminoid bog plus <i>Polytrichum commune</i> , <i>Sphagnum palustre</i> , <i>Erica tetralix</i> , <i>Agrostis canina</i> , <i>Deschampsia flexuosa</i> , occasional <i>Calluna vulgaris</i> ; mossy acid grass up to wall.
368	315329	597600	Tussocky bog with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberii</i> , plus <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> (latter forming flush zones).	384	315745	598131	<i>Eriophorum</i> bog but with much moss and <i>Juncus squarrosus</i> .
369	315326	597693	<i>Juncus effusus</i> with flushed acid grassland in burn valley; above fed by several fingers of <i>Sphagnum fallax</i> flushes from bog relics above.	385	315654	598196	Intermediate wet mossy acid grassland with relic bog (former extends up slope to wall and becoming drier, latter below); local <i>Juncus effusus</i> lines marking drains and flushes.
370	315369	597757	Bog spill (pet c. 35cm) with common <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> ), plus <i>Juncus squarrosus</i> , scarce <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , <i>Anthoxanthum odoratum</i> , <i>Rhytidiadelphus squarrosus</i> and occasional <i>Sphagnum</i> .	386	315580	598250	Rocky outcrop with shorter grazed pasture but seemingly little herb diversity; local <i>Juncus effusus</i> patches.
371	315475	597849	Tussocky graminoid bog but with some good areas of <i>Sphagnum</i> cover (mainly <i>S. fallax</i> and <i>S. capillifolium</i> ); <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberi</i> ) and between <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , (scarce <i>Calluna vulgaris</i> ), <i>Polytrichum commune</i> and <i>Sphagnum</i> .	387	315453	598220	Level area of wetter bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Sphagnum</i> (some <i>S. papillosum</i> ); very wet to centre with <i>Sphagnum</i> carpet plus <i>Aulacomnium</i> and <i>Narthecium ossifragum</i> .
372	315607	597762	Short grazed pasture with flush zones; locally enriched with <i>Lysimachia nemorum</i> , <i>Cardamine pratensis</i> , <i>Carex</i> spp., <i>Ranunculus acris</i> , <i>Viola riviniana</i> , <i>Luzula campestris</i> and <i>Prunella vulgaris</i> .	388	315430	598050	Extensive tussocky graminoid bog on gentle slope but with some <i>Sphagnum</i> , locally frequent and some <i>S. papillosum</i> ; <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Eriophorum angustifolium</i> , <i>Molinia caerulea</i> , and <i>Polytrichum commune</i> .
373	315549	597687	Base rich flush channel with <i>Palustriella falcata</i> (and possibly <i>P. commutata</i> ), <i>Philonotis calcarea</i> , <i>Calliergonella cuspidata</i> plus <i>Carex hostiana</i> , <i>C. demissa</i> , <i>C. dioica</i> and <i>Eriophorum angustifolium</i> .	389	315156	597894	Slope with wet acid grassland (frequent <i>Juncus squarrosus</i> ) but below very steep with <i>Nardus stricta</i> and <i>Vaccinium myrtillus</i> plus some <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> and <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
374	315457	597610	Diverse bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum</i> spp. ( <i>S. papillosum</i> rare).	390	315014	597892	Steep slope with shallowing graminoid peaty vegetation: <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Carex binervis</i> , <i>C. panicea</i> , <i>Vaccinium myrtillus</i> , <i>Potentilla erecta</i> , local <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , and abundant pleurocarp mosses.
				391	315068	598024	Steep burn sides with short grassland and occasional flush (some with <i>Palustriella commutata</i> , <i>Carex</i> spp., <i>Briza media</i> and <i>Pinguicula vulgaris</i> ); burn with some <i>Juncus effusus</i> and local <i>Chrysosplenium oppositifolium</i> .
				392	315045	598061	Isolated block of graminoid peaty grassland but on closer inspection with much <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Calluna vulgaris</i> (i.e. wet heath precursors).

393	314994	598089	Graminoid peaty grassland ( <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> ) but with many heath elements ( <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , and occasional short <i>Calluna vulgaris</i> and <i>Sphagnum capillifolium</i> ) plus <i>Polytrichum commune</i> and pleurocarp mosses.
394	315273	598283	Spill of mostly acid grassland (but peat c 25cm) with only occasional <i>Eriophorum vaginatum</i> relic tussocks; <i>Carex nigra</i> , <i>Nardus stricta</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Luzula multiflora</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
395	315390	598370	Extensive tussocky graminoid: <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Sphagnum fallax</i> , <i>S. capillifolium</i> and <i>Polytrichum commune</i> ; rare <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> or <i>Sphagnum papillosum</i> .
396	315365	598621	Leveller summit area with wetter bog (frequent <i>Sphagnum papillosum</i> and some large <i>S. capillifolium</i> hummocks).
397	315272	598678	Tussocky graminoid bog: <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Anthoxanthum odoratum</i> , <i>Polytrichum commune</i> <i>Rhytidiadelphus squarrosus</i> and spp.
398	315147	598666	Lower-lying block of wetter bog with much <i>S. fallax</i> and <i>S. papillosum</i> , plus <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Carex nigra</i> .
399	315332	598860	Shaded ride with tussocky <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> (favoured by shade) and some <i>Sphagnum</i> ; past felled area to east with dense cover of <i>Calluna vulgaris</i> , with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
400	315209	598459	Narrow spill of <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> (linked to bog slump above).
401	315121	598532	Weak spill of boggy relic with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> (and acidic grassland species).
402	314975	598270	Mossy (pleurocarps and <i>Polytrichum commune</i> ) acid grassland ( <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> , <i>Molinia caerulea</i> ) but with <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> and rare <i>Eriophorum vaginatum</i> tussocks.
403	315006	598314	Relic <i>Eriophorum vaginatum</i> tussocks with <i>Polytrichum commune</i> , plus occasional <i>Sphagnum capillifolium</i> , plus <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and <i>Agrostis canina</i> .
404	314951	598476	Wetter spill down to fence (with some <i>Eriophorum vaginatum</i> ) and continues as flush over fence (wet acid grassland).
405	314918	598582	Steep slope with acid grassland ( <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis</i> spp., <i>Juncus squarrosus</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> , and rare <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> and <i>Trichophorum germanicum</i> (latter more so below).
406	314820	598526	Top of feeder burn meets peaty edges; <i>Juncus effusus</i> with wet acid grassland; burn with <i>Stellaria alsine</i> and some <i>Callitriche stagnalis</i> .
407	314467	598578	Small <i>Juncus acutiflorus</i> marsh ( <i>Carex</i> spp., <i>Calliergonella cuspidata</i> ) and wider wet flushed grassland (rest of pasture somewhat enriched with <i>Cynosurus cristatus</i> and <i>Cirsium arvense</i> , and occasional bracken).
408	314343	598772	Burn with short steep sides through somewhat enriched pasture; a few patches of scrub (hawthorn and willow), bracken and male fern.
409	314438	598775	Valley with dense scrub of willow below (and locally above); steep sides with grassland and bracken (some <i>Molinia</i> to plantation edges above).
410	314155	599145	Roadside embankment with gravel heather cover.

411	314277	599219	Hard to access narrow glade on steep slope with acid grassland and large patches of bracken (more so below). Not visited.
412	314376	599469	Steep sided valley with scrubby birch and willow woodland; steep slope above with dense bracken and local heather patches.
413	314709	596490	Small spring (below <i>Molinia mire</i> relic above) with <i>Philonotis</i> and <i>Palustriella</i> , plus <i>Carex</i> spp.



## Target notes for north eastern area with Rue Gill Hill, Ewelairs Hill and Pot Hill

1	315843	600391	Ridge top with relic tussocky bog but heather dominated with local to frequent <i>Eriophorum vaginatum</i> with hypnoid mosses and some <i>Sphagnum capillifolium</i> plus <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum angustifolium</i> and some <i>Neottia (Listera) cordata</i> .
2	315985	600482	More bog relics but still heather-dominated (heath like) with occasional <i>Eriophorum vaginatum</i> and <i>Sphagnum capillifolium</i> plus <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> and hypnoid mosses.
3	315916	600567	Heather dominated slope on shallow to local deeper peats, with <i>Vaccinium myrtillus</i> , some <i>V. vitis-idaea</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Potentilla erecta</i> and hypnoid mosses; rare <i>Eriophorum vaginatum</i> or <i>Sphagnum capillifolium</i> relics (more bog relics above where less steep)
4	316218	600643	Species rich flushed grassland with <i>Carex</i> spp., <i>Galium uliginosum</i> , <i>Ajuga reptans</i> , <i>Geum rivale</i> , <i>Galium verum</i> , <i>Conopodium majus</i> and <i>Primula vulgaris</i> .
5	316256	600645	Wet tussocky wet heath dominated by <i>Molinia caerulea</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses plus some heather (peat c. 20cm).
6	316033	600726	Heather dominated gentle ledges with <i>Vaccinium myrtillus</i> plus occasional <i>Erica tetralix</i> , <i>Molinia caerulea</i> and hypnoid mosses and some <i>Sphagnum</i> (some <i>S. russowii</i> ); peat 30+ cm. Population of <i>Neottia (Listera) cordata</i> .
7	315857	600639	Steepening slope but with a similar appearing (to below) shrubby heather dominated canopy; <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses but on fairly deep peat (c. 25cm) indicating bog spill origins from above.
8	315866	600721	Deep peat but dominated by shrubby <i>Calluna vulgaris</i> with only rare <i>Eriophorum vaginatum</i> ; with <i>Vaccinium myrtillus</i> and hypnoid mosses plus rare or occasional <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
10	315831	600725	Tussocky bog in shallow valley head dominated by tall and tussocky heather with occasional <i>Eriophorum vaginatum</i> , and much hypnoid mosses (some <i>Sphagnum</i> ) plus occasional <i>Erica tetralix</i> and <i>Empetrum nigrum</i> ; frequent erosion gullies and ridges.
11	315835	600770	Rising slope with less <i>Eriophorum vaginatum</i> (restricted to wetter flush lines) but on deep peat; dominated by tussocky heather with some <i>Vaccinium myrtillus</i> and hypnoid mosses (occasional <i>Sphagnum</i> ) plus some <i>Eriophorum angustifolium</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> and <i>Empetrum nigrum</i> .
12	315831	600914	Area of heather dieback with increased <i>Eriophorum vaginatum</i> and <i>Vaccinium myrtillus</i> plus hypnoid mosses and <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> ; some erosion gullies (less hidden due to reduced heather).
13	315898	601012	Gentle slope dominated by heather with little <i>Eriophorum vaginatum</i> but on deep peat (40cm) and some erosion type gullies or edges; hypnoid mosses common but <i>Sphagnum</i> infrequent; gullies or flushes with <i>Molinia caerulea</i> , <i>Narthecium ossifragum</i> and some <i>Eriophorum vaginatum</i> .
14	316289	601117	<i>Eriophorum vaginatum</i> becoming rare but local in the fingers of erosion gullies down slope (some <i>Carex nigra</i> , and <i>Juncus</i> ).
15	316318	601160	<i>Calluna vulgaris</i> dominated heath with <i>Vaccinium myrtillus</i> ; no <i>Eriophorum vaginatum</i> but on deep peat, and some local <i>Rubus chamaemorus</i> .
16	316230	601228	Bog pool with <i>Sphagnum fallax</i> and <i>Eriophorum</i> spp.; but also curiously some wet acid grassland (bent fescue type); various erosion gullies and slight hags above.
17	316170	601234	Broad cover of shrubby heather dominated bog with occasional <i>Eriophorum vaginatum</i> plus <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> with much hypnoid moss and some <i>Sphagnum capillifolium</i> plus

			<i>Ptilidium ciliare</i> .
18	316002	601323	Heather dominated bog; here small wetter area with <i>Sphagnum papillosum</i> .
19	316186	601349	Species-rich flushed grassland (some <i>Juncus</i> zones) with <i>Carex</i> spp., (some <i>C. caryophylla</i> , <i>C. pulicaris</i> ), <i>Lysimachia nemorum</i> , <i>Succisa pratensis</i> , <i>Conopodium majus</i> , <i>Geum rivale</i> and <i>Angelica sylvestris</i> .
20	316233	601389	Flushed species rich grassland on lower slopes with much <i>Carex panicea</i> and some <i>Nardus stricta</i> but also <i>Carex flacca</i> , <i>Avenula pubescens</i> , <i>Conopodium majus</i> , <i>Anemone nemorosa</i> , <i>Filipendula ulmaria</i> , <i>Ajuga reptans</i> and others noted above.
21	316205	601431	Scree (mostly loose and acidic with <i>Pogonatum urnigerum</i> ); adjacent grassland diverse with <i>Avenula pubescens</i> , <i>Potentilla sterilis</i> , <i>Anemone nemorosa</i> , <i>Carex flacca</i> and <i>Galium sternerii</i> .
22	316260	601478	Extensive flushed grassland (grey blue sheen from <i>Carex</i> spp.) with <i>Conopodium majus</i> , <i>Avenula pubescens</i> , <i>Deschampsia cespitosa</i> , <i>Holcus mollis</i> and <i>Poa humilis</i> .
24	316038	601372	Bog on slope but shallower peat and reduced, patchy <i>Eriophorum vaginatum</i> ; mostly hypnoid mosses with <i>Vaccinium myrtillus</i> , and occasional <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
25	316091	601488	Large flushed grassland with <i>Carex panicea</i> plus <i>Juncus conglomeratus</i> plus some <i>Avenula pubescens</i> and <i>Carex pulicaris</i> .
26	316150	601541	Species rich flushes with <i>Carex</i> spp., <i>Ajuga reptans</i> , <i>Lysimachia nemorosa</i> , <i>Crepis paludosa</i> , <i>Silene flos-cuculi</i> , <i>Geum rivale</i> ; some spring like flushing with <i>Chrysosplenium oppositifolium</i> , <i>Philonotis fontana</i> and <i>Dicranella palustris</i>
27	316145	601587	Small stony scree; adjacent heath and grass with some bluebell.
28	316053	601634	Shallower peat on slope with short heather plus hypnoid mosses, <i>Empetrum nigrum</i> and <i>Vaccinium</i> spp.; <i>Eriophorum</i> restricted to depressions or locally by the fence
29	316081	601711	Shallow to deep peat dominated by <i>Calluna vulgaris</i> and no or rare <i>Eriophorum vaginatum</i> but presumably bog relic.
30	316073	601748	More bog-like vegetation but very dry with heather with <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> but little <i>Eriophorum vaginatum</i> (peat 30+ cm).
31	316092	601802	Erosion gullies (some <i>Narthecium ossifragum</i> ) and edges with scattered <i>Eriophorum vaginatum</i> and occasional <i>Sphagnum capillifolium</i> and on deep peat (40cm) but dominated by shrubby heather.
32	316233	601921	Deep peat edge (2m) but similar heather dominated vegetation to either side, though below there are frequent erosion gullies and ridges (but some above).
33	316227	601943	Series of narrow flush lines below peat edge with wet grass ( <i>Nardus stricta</i> ) and much <i>Cirsium palustre</i> .
34	316230	601984	Undulating eroded bog on deep peat (some shallower in depressions); heather-dominated (and hypnoid moss) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> mostly rare below.
35	316347	601966	Vegetation more even on gently sloping ground and gradually grading from heather dominated bog to heather dominated heath (rather arbitrary distinction); more obvious heath or wet heath below to valley head
36	316351	602107	Broad level area of undulating bog with many gullies and ridges, but generally dry and heather dominated and very tussocky; <i>Eriophorum vaginatum</i> local (mainly to gullies, where some <i>Narthecium ossifragum</i> and more <i>Sphagnum</i> ).
37	316400	602234	Slopes with rather intermediate bog or heath vegetation both dominated by heather (peat c. 30cm +) with <i>Vaccinium</i> spp, <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> and some <i>Molinia caerulea</i> (but rare <i>Eriophorum vaginatum</i> ).
38	316354	602239	Intermediate heath or bog dominated by shrubby heather with hypnoid moss and no <i>Eriophorum vaginatum</i> (except locally).
39	316336	602286	Deep peat and some <i>Eriophorum vaginatum</i> and locally <i>Rubus chamaemorus</i> but all



			heather dominated and heath-like.
40	316242	602352	Flushed grassland some with much <i>Carex nigra</i> but also local <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> (fed by weak spill from bog above by fence).
41	316271	602365	Bog strip by fence (more <i>Eriophorum vaginatum</i> to west side) but grading on east side to monotonous heather domination; locally much <i>Rubus chamaemorus</i> .
42	316411	602604	Extensive monotonous cover of <i>Calluna vulgaris</i> (but no peat c. 20cm); some <i>Melampyrum pratense</i> here.
43	316403	602661	Slopes with shallower peat (some to 20cm though) with no <i>Eriophorum vaginatum</i> (some above); heather dominated with <i>Vaccinium myrtillus</i> and hypnoid mosses; boggier to central valley and some wet heath-like patches.
44	316372	602796	Bog edges and depressions (erosion) with locally <i>Eriophorum vaginatum</i> and <i>Narthecium ossifragum</i> in lower flushes; <i>Rubus chamaemorus</i> frequent.
45	316341	602788	Bog with much <i>Rubus chamaemorus</i> ; mostly dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and <i>Eriophorum vaginatum</i> (but sparingly), with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , and hypnoids with frequent <i>Rhytidiadelphus loreus</i> .
46	316396	602862	Bog pool ( <i>Sphagnum fallax</i> , and some <i>S. papillosum</i> ).
47	316448	602944	Small bog pool ( <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> ); much <i>Rubus chamaemorus</i> in surrounding bog.
48	316484	603041	Bog with much <i>Rubus chamaemorus</i> , plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> and frequent <i>Sphagnum</i> ; deep drain to edge.
49	316599	602981	Extensive monotonous <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses; dry heath like but with some deep peat (>25cm) indicating drying bog affinities.
50	316450	603262	Shrubby heather dominated dry bog but only local area at ridge summit with some <i>Eriophorum vaginatum</i> .
51	316654	603365	Small stream meets road (to north of here), where some <i>Saxifraga stellaris</i> ; <i>Thymus</i> frequent in roadside gravels.
52	316947	601247	Steep slope with mosaic or intermediate acid grassland and <i>Vaccinium</i> heath (scarce <i>Calluna</i> or wet heath elements).
53	317080	601265	Steeper slope to summit with much <i>Vaccinium myrtillus</i> (with <i>Pleurozium schreberi</i> and <i>Deschampsia flexuosa</i> ) parallel fence, with acid grassland further away (locally flushes with <i>Carex nigra</i> ); some <i>Festuca vivipara</i> .
54	317064	601411	Steep slope with acid grass and <i>Vaccinium myrtillus</i> but some increasing wet heath elements and flushing ( <i>Carex nigra</i> ).
55	316909	601468	Steep slope with an acid grassland and heath cover, often in mosaics; below some wet heath (and much <i>Molinia</i> nearer fence).
56	316790	601453	Valley floor with drained and more fertile grassland locally with some herb diversity, but also some acid relics and frequent <i>Juncus acutiflorus</i> flushes and strips (larger upstream); some <i>Cirsium helenoides</i> .
57	316977	601573	<i>Molinia caerulea</i> common with some <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , but also grassy with much <i>Agrostis vinealis</i> and <i>Deschampsia flexuosa</i> (and frequent <i>Vaccinium myrtillus</i> ).
58	317066	601653	Extensive slope with mosaic of <i>Molinia tussocks</i> and acid grasses all with <i>Vaccinium myrtillus</i> , but the latter forming distinct heathy patches (with <i>Deschampsia flexuosa</i> and <i>Pleurozium schreberi</i> ).
59	317168	601542	Peaty spill with <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> plus <i>Empetrum nigrum</i> and <i>Erica tetralix</i> .
60	317176	601559	Boggy spill of mostly <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , hypnoid mosses and occasional <i>Erica tetralix</i> and <i>Eriophorum vaginatum</i> (peat 30cm+).

61	317237	601632	Extensive area of tussocky <i>Molinia</i> vegetation with <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Anthoxanthum odoratum</i> , <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> and some <i>Festuca vivipara</i> .
62	317332	601737	Strip of bog vegetation (very uneven) locally with much <i>Sphagnum</i> (but seeming mostly <i>S. palustre</i> ); <i>Calluna</i> with <i>Eriophorum vaginatum</i> plus <i>Empetrum nigrum</i> and <i>Vaccinium myrtillus</i> , and also <i>Carex nigra</i> and acid grassland elements at erosion edges.
63	317401	601842	Edge of bog with some gullies, locally with <i>Carex rostrata</i> ; also some <i>Carex bigelowii</i> .
64	317507	601856	Diverse bog with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum</i> spp., <i>Erica tetralix</i> , <i>Rubus chamaemorus</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>Polytrichum strictum</i> and <i>Aulacomnium palustre</i> .
65	317474	601867	Flushed grassland by bog with much <i>Carex bigelowii</i> (plus <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> and <i>Vaccinium myrtillus</i> ).
66	317390	601910	Top of steep valley with big patch of <i>Luzula sylvatica</i> ; mostly acidic grassland but with much <i>Carex nigra</i> and some heath elements
67	317649	601967	Bog with <i>Vaccinium vitis-idaea</i> , <i>Eriophorum</i> spp., <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>Polytrichum strictum</i> .
68	317724	602202	Disturbed (tracks and deep drains) parallel fence with bog elements but much acidic grassland ( <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium</i> spp.).
69	317680	602252	Steep slope with a mosaic of acid grassland and patches of <i>Vaccinium myrtillus</i> ; species include <i>Festuca ovina</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>C. binervis</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> and mosses <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
70	317758	602321	Isolated relic of bog but with some <i>Rubus chamaemorus</i> plus <i>Vaccinium vitis-idaea</i> and <i>Sphagnum capillifolium</i> .
71	317755	602512	Relic area of disturbed bog with <i>Vaccinium</i> spp., <i>Eriophorum</i> sp., <i>Calluna vulgaris</i> , <i>Empetrum nigrum</i> but also acid grassland elements; some <i>Melampyrum pratense</i> noted.
72	317687	602507	Wet heath spill and flushed acid grassland with <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>C. panicea</i> and hypnoid mosses.
73	317609	602572	Erosion gully with <i>Carex nigra</i> , <i>C. echinata</i> , and some <i>C. pulicaris</i> and <i>Cirsium palustre</i> .
74	317589	602580	Extensive bog on level area but sloping and eroding gullies to the west: <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> and hypnoid mosses.
75	317543	602593	Hollow with <i>Carex rostrata</i> and <i>Sphagnum</i> extending down slope in flushed channel; with <i>Carex echinata</i> , <i>C. nigra</i> , <i>Eriophorum angustifolium</i> and <i>Polytrichum commune</i> .
76	317478	602670	Relic bog with some <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Vaccinium vitis-idaea</i> and <i>Rubus chamaemorus</i> .
77	317353	602754	Shallow valley with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> but also flushed <i>Carex nigra</i> , <i>C. echinata</i> , <i>Agrostis vinealis</i> , <i>Molinia caerulea</i> and below <i>Juncus effusus</i> .
78	317263	602802	Tussocky bog on slope dominated by <i>Calluna vulgaris</i> with some <i>Vaccinium myrtillus</i> , with little <i>Eriophorum vaginatum</i> ; peat often deeper than 30cm but vegetation appearing heath-like.
79	317224	602748	Broad strip down to valley with flushed acid grassland (much <i>Agrostis vinealis</i> , <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> and occasional <i>Juncus effusus</i> ).
80	317100	602857	Shallow valley with acid grassland ( <i>Agrostis vinealis</i> , <i>Carex nigra</i> , <i>Anthoxanthum</i>

			odoratum, <i>Nardus stricta</i> ) and some heath islets.
81	316862	602884	Flushed grassland with some <i>Nardus stricta</i> and <i>Deschampsia cespitosa</i> plus <i>Carex</i> spp (some <i>C. pulicaris</i> ), <i>Conopodium majus</i> and <i>Avenula pubescens</i> .
82	317203	602966	Upper area mostly level and appearing dry with little <i>Eriophorum vaginatum</i> obvious, and several finger like ridges and gullies (where more wet, or dry, heath elements and some acid grassland, flushed or drier); <i>Calluna</i> dominates with <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> , occasional <i>Molinia caerulea</i> and mostly hypnoid mosses.
83	317228	602974	Enormous <i>Sphagnum capillifolium</i> hummock (3m x 2m x 1m tall).
84	317227	603014	Wetter hollow with increased <i>Eriophorum vaginatum</i> and also some <i>Sphagnum papillosum</i> ; some <i>Rubus chamaemorus</i> .
85	317129	603011	Erosion gully or valley with more <i>Eriophorum vaginatum</i> but also <i>Carex nigra</i> , <i>Nardus stricta</i> , <i>Agrostis vinealis</i> and <i>Deschampsia flexuosa</i> ; splits below where flushed acidic grassland and local <i>Juncus effusus</i> patches.
86	317201	603101	Leveller area of shallower peat with abundant <i>Calluna vulgaris</i> but more <i>Molinia caerulea</i> , plus some <i>Empetrum nigrum</i> , <i>Erica tetralix</i> , <i>Vaccinium</i> spp, <i>Eriophorum angustifolium</i> and rare <i>Eriophorum vaginatum</i> (more so to lower-lying areas).
87	317062	603168	Shallower slope below drier ridge, deeper peat but similar-appearing <i>Calluna vulgaris</i> -dominated heath vegetation (local <i>Eriophorum angustifolium</i> , rare <i>E. vaginatum</i> and some <i>Empetrum nigrum</i> ).
88	317227	603403	East of fence some wet heath, or bog, relics with locally much <i>Vaccinium vitis-idaea</i> .
89	317034	603407	Broad valley like gully with flushed <i>Nardus stricta</i> grassland with <i>Carex</i> spp, and above some channels with <i>Carex rostrata</i> ; further up the gully is more bog like but with some acid grassland elements.
90	317230	603607	East of fence some local bog relics mixed in with acid grassland; here some odd <i>Sphagnum capillifolium</i> cones.
91	317115	603658	Bog with abundant <i>Rubus chamaemorus</i> and local <i>Sphagnum</i> .
92	317107	603717	Broad strip of wetter bog (appears >40cm) with frequent <i>Eriophorum vaginatum</i> and some <i>Rubus chamaemorus</i> .

#### Target notes for additional areas survey in 2020

1	309634	599226	SUDS pond (much <i>Phragmites</i> plus <i>Typha</i> and <i>Juncus acutiflorus</i> ) with colonizing willow and alder to margins; set adjacent to huge manure heap.
2	309739	599020	Small fenced off SUDS ponds (eastern one with <i>Phragmites</i> ).
3	310000	598887	<i>Juncus acutiflorus</i> dominated marsh here, quite diverse with <i>Angelica sylvestris</i> , <i>Ajuga reptans</i> , <i>Caltha palustris</i> , <i>Cirsium palustre</i> , <i>Ranunculus repens</i> and <i>Calliergonella cuspidata</i> ; <i>Juncus effusus</i> dominates further east. A few rough grass ridges occur but these tend to become coarse ( <i>Dactylis glomerata</i> , <i>Centaurea nigra</i> , <i>Anthriscus sylvestris</i> ).
4	310050	598823	Drain and small pool (some <i>Phalaris</i> and <i>Typha</i> ) in otherwise inundated <i>Juncus effusus</i> dominated marsh (seems low diversity).
5	310165	598637	<i>Juncus effusus</i> dominated marsh (inundated) with some <i>Phalaris</i> , <i>Ranunculus flammula</i> and <i>Calliergon cordifolium</i> ; adjacent grassland appears to be neutral (rather than acidic) but tending to be grass dominated (some <i>Rumex acetosa</i> , <i>Ranunculus acris</i> , <i>Plantago lanceolata</i> and <i>Veronica chamaedrys</i> ).

6	310143	598581	Bridge over railway, the sides of the latter with adjacent parallel swale supporting gravel or rough grass (and tall herbs) and much scrub (broom, birch and willow); rank grass to railway banks.
7	310103	598434	Low-lying mire dominated by <i>Juncus acutiflorus</i> with <i>Rumex acetosa</i> , <i>Ranunculus repens</i> , <i>Myosotis</i> sp., <i>Ranunculus omiophyllus</i> , <i>Caltha palustris</i> and the moss <i>Calliergonella cuspidata</i> . <i>Juncus effusus</i> increases to the south near the wall (and down to railway).
8	310264	599148	Narrow marsh or swamp channel below steep bank; <i>Filipendula ulmaria</i> common to the drier margin but <i>Phalaris</i> , <i>Agrostis stolonifera</i> and <i>Glyceria fluitans</i> frequent to the wetter channel; some <i>Carex disticha</i> present.
9	310338	599008	<i>Juncus effusus</i> marsh in small valley but fairly dry with limited associates; adjacent grassland with scattered to frequent <i>Juncus effusus</i> (more so above),
10	310439	598566	Waste ground area (dumping of agricultural wastes and lime mounds), with some short open turf: <i>Trifolium</i> spp., <i>Hypochoeris radicata</i> , <i>Prunella vulgaris</i> , <i>Aphanes arvensis</i> s.l. and mosses such as <i>Racomitrium canescens</i> and <i>Polytrichum juniperum</i> ; also some broom scrub.
11	310455	598632	Old quarry area now fenced off and with a poorly draining but somewhat enriched pasture; <i>Juncus effusus</i> prominent but much recently topped (and currently high stock density).
12	310215	597891	Area of <i>Carex rostrata</i> dominated swamp with <i>Juncus</i> spp. mire to margins (some <i>Phalaris</i> ); very difficult to access due to high water.
13	310247	597957	<i>Juncus effusus</i> dominated pasture but hardly marshy, and appearing to be of limited herb diversity
14	310547	598467	Swamp with <i>Phalaris</i> and some <i>Typha</i> , grading to <i>Juncus effusus</i> dominated wet grassland, locally gravelly with more diversity.
15	310626	598453	Area of periodically flooded grassland (relatively less improved) between riverbank (alder and a few herbs), and raised embankment (topped by mature oak or beech and much broom scrub)
16	310579	598644	Open water of lagoon fringed by very dense willow and alder (and some broom) scrub; some new tree planting to the north. Inundated margins to lagoon (level currently very high) but appears to be steep sided with poor marginal flora.
17	310662	598543	Levee bank between river and lagoon, mostly with dense <i>Rubus</i> spp or <i>Juncus effusus</i> , or developing scrub (more so to the lagoon edge); riverbanks (both sides) with narrow fringe of alder woodland.
18	311313	599346	Small valley with steep sides (and waterfall) with a few relic mature trees (some oak, rowan and willow) plus bracken and other ferns, moss and some <i>Primula vulgaris</i> and <i>Luzula sylvatica</i> .
19	311214	599403	<i>Juncus acutiflorus</i> dominated marshy slopes in otherwise enriched pasture (but often poorly draining, and badly poached below); associates include <i>Montia fontana</i> , <i>Cirsium palustre</i> , <i>Rumex acetosa</i> , <i>Galium palustre</i> , <i>Ranunculus</i> spp (include some <i>R. omiophyllus</i> ½ indicating persistent pooling), and mosses such as <i>Calliergonella cuspidata</i> and <i>Brachythecium rivulare</i>
20	311314	599549	Lower slopes with <i>Juncus acutiflorus</i> mire (locally with some <i>Carex</i> spp., and <i>Potamogeton polygonifolius</i> ); above is enriched pasture but to the leveller ridge further above the pasture is poorly draining with much <i>Juncus effusus</i> (some topped).

21	311352	599937	Broad ridge on gentle slope variously enriched and improved but very wet and poorly draining with locally abundant <i>Juncus effusus</i> (although much has been topped).
22	311486	600801	Very wet and poached pasture with some <i>Juncus effusus</i> (but topped or grazed back). Slope below very wet but increasing <i>Juncus effusus</i> below towards wetter hollow (but not marsh vegetation).
23	311634	600692	Narrow drain separates <i>Juncus effusus</i> dominated marshy pasture in low-lying area; herb diversity appears low (much poaching and enrichment)
24	311974	600617	<i>Molinia</i> dominates but here locally with frequent <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> (i.e. wet heath affinity) plus <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum capillifolium</i> and <i>Hylocomium splendens</i> ; grades below to wetter mire conditions (including increasing <i>Juncus acutiflorus</i> )
25	312078	600575	Several small ridges with acidic grassland and here with short <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> plus much <i>Hylocomium splendens</i> and occasional <i>Carex binervis</i> .
26	312094	600571	Wet <i>Molinia</i> mire (not really wet heath) but with some <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Carex</i> spp., and <i>Sphagnum</i> .
27	312133	600331	Large area of low-lying tussocky <i>Molinia</i> dominated mire (with some heath elements) but also <i>Juncus acutiflorus</i> dominated flushes and channels.
28	312209	600475	Boulder and stone scree with acidic grassland and bracken plus occasional dry heath element (some <i>Erica cinerea</i> ), various mosses ( <i>Racomitrium</i> spp., <i>Dicranum</i> etc.) and lichens ( <i>Parmelia</i> spp., <i>Sphaerophorus</i> , and crustose types).
29	314010	599409	Edge of large area of low-lying <i>Juncus acutiflorus</i> mire (with <i>Calliergonella cuspidata</i> , plus <i>Rhytidiadelphus squarrosus</i> , <i>Rumex acetosa</i> , <i>Cirsium palustre</i> , <i>Molinia caerulea</i> and <i>Caex</i> spp.).
30	314136	599810	Burn valley to either side of bridge with developing scrub (mainly willows) with coarse grass glades and occasional heather patch; <i>Luzula sylvatica</i> to side with some male fern but seemingly few woodland elements.
31	314146	599983	Broad level area dominated by heather over hypnoid mosses, but local too dense patches of <i>Sphagnum</i> moss, giving a wet heath appearance.
32	315767	601034	<i>Vaccinium vitis-idaea</i> frequent in bog vegetation
33	315972	601014	Some <i>Lycopodium clavatum</i> to the track edge
34	315836	602353	The club-moss species present: <i>Lycopodium clavatum</i> , <i>Huperzia selago</i> and <i>Diphasiastrum alpinum</i> .
35	315885	602415	Gravelly heather margins locally with diverse club-moss populations ( <i>Lycopodium clavatum</i> most widespread but some <i>Huperzia selago</i> and <i>Diphasiastrum alpinum</i> ).
36	315982	602888	Large patch of broom to the track side (and scattered further down track) but track sides mostly dominated by heather and mosses; several patches of <i>Lycopodium clavatum</i> noted.
37	316055	603084	Steep sided valley with bracken dominating the northern side, but acid grass and heather to the southern.
38	316078	603133	Lower slope with <i>Molinia caerulea</i> and pine relics
39	316111	603214	Narrow glade with dead pines and much heather dieback and patches of mossy grassland, and frequent <i>Vaccinium myrtillus</i> .
40	316200	603275	Flushed acid grassland area in otherwise heather dominated area (one patch of <i>Luzula sylvatica</i> ).

41	316388	603210	<i>Vaccinium vitis-idaea</i> frequent
42	316700	603313	Water course slope with much flushing, some rush dominated but others with wet grassland (some <i>Nardus stricta</i> and <i>Carex panicea</i> ).
43	316871	601700	Broad area of <i>Juncus acutiflorus</i> mire, mostly minerotrophic but with some patches of <i>Sphagnum</i> (and occasional heather).
44	316858	601633	<i>Juncus effusus</i> marsh (flattened by erosion, and with some deep erosion channels to the southeast); associates include <i>Ajuga reptans</i> , <i>Chrysosplenium oppositifolium</i> and <i>Ficaria verna</i> .
45	316810	601543	Tussocky acid grass with <i>Agrostis capillaris</i> and <i>Deschampsia cespitosa</i> with much <i>Rhytidiadelphus squarrosus</i> and <i>Hylocomium splendens</i> , plus <i>Galium saxatile</i> , <i>Achillea millefolium</i> , <i>Rumex acetosa</i> , <i>Pseudoscleropodium purum</i> ; local <i>Ajuga reptans</i> and <i>Ranunculus repens</i> indicating transition to marshy flushes.
46	315734	593926	<i>Juncus acutiflorus</i> dominates but with some mossy acid grassland areas and several old drains; <i>Carex</i> spp frequent, with <i>Ranunculus</i> spp (some <i>Ficaria verna</i> showing).
47	315695	593833	Short grazed flush, but quite diverse with <i>Carex</i> spp and <i>Calliergonella cuspidata</i> ; dissolves below into the grassland
48	316119	592913	Very steep bank with below a narrow band of mature ash plus oak, hazel and hawthorn with some ferns but mostly a grazed grassland ground cover; some acid grass in open (rare heather and blaeberry) but much bracken above (and upper slopes further above drenched with slurry).
49	316030	592440	Scrubby woodland covering east side of burn with much ash and hazel, over bracken and grass, but some woodland elements visible: <i>Stellaria holostea</i> , <i>Primula vulgaris</i> , <i>Potentilla sterilis</i> , <i>Chrysosplenium oppositifolium</i> and mosses include much <i>Eurhynchium striatum</i> and <i>Rhytidiadelphus triquetrus</i> . Roadside lined by dense scrub on both sides.
50	316126	592343	Burn with woodland parallel road; mature beech (heavy shading) dominates the western boundary, but elsewhere ash frequent (quite scrubby though, with much young beech); ground flora seems impoverished: <i>Deschampsia cespitosa</i> and <i>Rubus fruticosus</i> frequent, local <i>Polystichum aculeatum</i> to rocks, and several introduced plants including extensive, dense carpets of <i>Lamiasstrum argentatum</i> .
51	316214	592435	Very steep bank with relic trees (mature ash, hawthorn) but heavily grazed mossy grass forming ground flora; grassland less improved on slopes and to the leveller burn sides.
52	316416	592720	Heavily drained mire with much <i>Juncus acutiflorus</i> and mossy acid grassland associates; adjacent western area (fenced off) more grassy and drier, and presumably past enriched but appearing similar.
53	319238	594145	Mosaic of new woodland, scrub, acid grass, bracken and marshy flushes; south side with steep acidic grassland embankment (plus scrub, bracken and heather). All a rather complex area difficult to map, or code.
54	319317	594129	Large patches of marsh between (and under) trees with much <i>Filipendula ulmaria</i> plus some <i>Valeriana officinalis</i> , <i>Ficaria verna</i> , <i>Equisetum fluviatile</i> and <i>Rumex sanguineus</i> .



55	319444	594100	Valley about burn with much new broad-leaf tree planting and some relic shrubs, tending to coalesce (ash, rowan, willow, hawthorn and hazel); rather complicated mosaic with patches of drier acid grassland (some wet with <i>Deschampsia cespitosa</i> ), bracken and also large wet flushes ( <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> ).
56	319688	593995	Shallow pond with much open water (some <i>Potamogeton natans</i> ) with large marginal <i>Typha latifolia</i> swamp zones, with <i>Eleocharis palustris</i> to the outer edges; other species noted include <i>Ranunculus flammula</i> , <i>Myosotis scorpioides</i> , <i>Agrostis stolonifera</i> , <i>Veronica beccabunga</i> and <i>Callitriche stagnalis</i> .
57	319829	593943	Broad short grassy glade, with a more neutral appearance with frequent <i>Deschampsia cespitosa</i> plus local <i>Achillea millefolium</i> , <i>Lathyrus pratensis</i> and <i>Rhinanthus minor</i> .
58	319843	593700	Three prominent tussocks of <i>Carex paniculata</i> in extensive low-lying mire: <i>Juncus acutiflorus</i> dominated with <i>Filipendula ulmaria</i> , <i>Deschampsia cespitosa</i> , <i>Equisetum fluviatile</i> and <i>Carex rostrata</i> .
59	319442	593310	Marshy area (with <i>Juncus effusus</i> but to west <i>J. acutiflorus</i> dominated); associates include <i>Ranunculus repens</i> , various mosses and occasional <i>Angelica sylvestris</i> .

## Appendix 8.10 - Plant Species Lists

Scientific name	Common Name
<i>Achillea ptarmica</i>	Sneezewort
<i>Agrostis canina</i>	Velvet Bent
<i>Agrostis capillaris</i>	Common Bent
<i>Agrostis stolonifera</i>	Creeping Bent
<i>Agrostis vinealis</i>	Brown Bent
<i>Ajuga reptans</i>	Bugle
<i>Alchemilla filicaulis subsp. vestita</i>	Common Lady's mantle
<i>Alchemilla glabra</i>	Smooth Lady's-mantle
<i>Anemone nemorosa</i>	Wood Anemone
<i>Angelica sylvestris</i>	Wild Angelica
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Arrhenatherum elatius</i>	False Oat-Grass
<i>Athyrium filix-femina</i>	Lady-fern
<i>Avenula pubescens</i>	Downy Oat-grass
<i>Bellis perennis</i>	Daisy
<i>Betula pubescens</i>	Downy Birch
<i>Blechnum spicant</i>	Hard-fern
<i>Briza media</i>	Quaking-grass
<i>Calluna vulgaris</i>	Heather
<i>Caltha palustris</i>	Marsh-marigold
<i>Campanula rotundifolia</i>	Harebell
<i>Cardamine flexuosa</i>	Wavy Bitter-cress
<i>Cardamine pratensis</i>	Cuckooflower
<i>Carex acutiformis</i>	Lesser Pond-sedge
<i>Carex bigelowii</i>	Stiff Sedge
<i>Carex binervis</i>	Green-ribbed Sedge
<i>Carex caryophyllea</i>	Spring-sedge
<i>Carex demissa</i>	Common Yellow-sedge
<i>Carex dioica</i>	Dioecious Sedge
<i>Carex echinata</i>	Star Sedge
<i>Carex flacca</i>	Glaucous Sedge
<i>Carex hostiana</i>	Tawny Sedge
<i>Carex laevigata</i>	Smooth-stalked Sedge
<i>Carex lasiocarpa</i>	Slender Sedge
<i>Carex leporina</i>	Oval Sedge
<i>Carex nigra</i>	Common Sedge
<i>Carex panicea</i>	Carnation Sedge
<i>Carex pilulifera</i>	Pill Sedge
<i>Carex pulicaris</i>	Flea Sedge
<i>Carex rostrata</i>	Bottle Sedge
<i>Ceratocarpus claviculata</i>	Climbing Corydalis
<i>Chamerion angustifolium</i>	Rosebay Willowherb
<i>Chrysosplenium oppositifolium</i>	Opposite-leaved Golden-saxifrage
<i>Cirsium arvense</i>	Creeping Thistle
<i>Cirsium heterophyllum</i>	Melancholy Thistle
<i>Cirsium palustre</i>	Marsh Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Cochlearia officinalis sens. lat.</i>	N/A
<i>Comarum palustre</i>	Marsh Cinquefoil

<i>Conopodium majus</i>	Pignut
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Crepis paludosa</i>	Marsh Hawk's-beard
<i>Cryptogramma crispa</i>	Parsley Fern
<i>Cynosurus cristatus</i>	Crested Dog's-tail
<i>Dactylorhiza maculata</i>	Heath Spotted-orchid
<i>Danthonia decumbens</i>	Heath-grass
<i>Deschampsia cespitosa</i>	Tufted Hair-grass
<i>Deschampsia flexuosa</i>	Wavy Hair-grass
<i>Digitalis purpurea</i>	Foxglove
<i>Drosera rotundifolia</i>	Round-leaved Sundew
<i>Dryopteris affinis agg.</i>	Scaly Male-fern
<i>Dryopteris carthusiana</i>	Narrow Buckler-Fern
<i>Dryopteris dilatata</i>	Broad Buckler-fern
<i>Dryopteris filix-mas</i>	Male-fern
<i>Dryopteris oreades</i>	Mountain Male-fern
<i>Empetrum nigrum</i>	Crowberry
<i>Epilobium brunnescens</i>	New Zealand Willowherb
<i>Epilobium obscurum</i>	Short-fruited Willowherb
<i>Epilobium palustre</i>	Marsh Willowherb
<i>Equisetum arvense</i>	Field Horsetail
<i>Equisetum fluviatile</i>	Water Horsetail
<i>Equisetum palustre</i>	Marsh Horsetail
<i>Equisetum sylvaticum</i>	Wood Horsetail
<i>Erica cinerea</i>	Bell Heather
<i>Erica tetralix</i>	Cross-leaved Heath
<i>Eriophorum angustifolium</i>	Common Cottongrass
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass
<i>Festuca ovina</i>	Sheep's-fescue
<i>Festuca rubra agg.</i>	Red Fescue
<i>Ficaria verna</i>	Lesser Celandine
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Fraxinus excelsior</i>	Ash
<i>Galium palustre</i>	Marsh-bedstraw
<i>Galium saxatile</i>	Heath Bedstraw
<i>Galium sternerii</i>	Limestone Bedstraw
<i>Galium uliginosum</i>	Fen Bedstraw
<i>Galium verum</i>	Lady's Bedstraw
<i>Geum rivale</i>	Water Avens
<i>Glyceria fluitans</i>	Floating Sweet-grass
<i>Hieracium vulgatum</i>	Common Hawkweed
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Holcus mollis</i>	Creeping Soft-grass
<i>Hyacinthoides non-scripta</i>	Bluebell
<i>Hypericum humifusum</i>	Trailing St John's-wort
<i>Hypericum pulchrum</i>	Slender St John's-wort
<i>Hypericum tetrapterum</i>	Square-stalked St John's-wort
<i>Hypochaeris radicata</i>	Cat's-ear
<i>Juncus acutiflorus</i>	Sharp-flowered Rush
<i>Juncus articulatus</i>	Jointed Rush
<i>Juncus bulbosus</i>	Bulbous Rush
<i>Juncus conglomeratus</i>	Compact Rush

<i>Juncus effusus</i>	Soft-rush
<i>Juncus squarrosus</i>	Heath Rush
<i>Lathyrus linifolius</i>	Bitter-vetch
<i>Lathyrus pratensis</i>	Meadow Vetchling
<i>Linum catharticum</i>	Fairy Flax
<i>Lonicera periclymenum</i>	Honeysuckle
<i>Luzula campestris</i>	Field Wood-rush
<i>Luzula multiflora</i>	Heath Wood-rush
<i>Luzula pilosa</i>	Hairy Wood-rush
<i>Luzula sylvatica</i>	Great Wood-rush
<i>Lycopodium clavatum</i>	Stag's-horn Clubmoss
<i>Lysimachia nemorum</i>	Yellow Pimpernel
<i>Melampyrum pratense</i>	Common Cow-wheat
<i>Menyanthes trifoliata</i>	Bogbean
<i>Molinia caerulea</i>	Purple Moor-grass
<i>Montia fontana</i>	Blinks
<i>Myosotis secunda</i>	Creeping Forget-me-not
<i>Nardus stricta</i>	Mat-grass
<i>Narthecium ossifragum</i>	Bog Asphodel
<i>Neottia cordata</i>	Lesser Twayblade
<i>Oreopteris limbosperma</i>	Lemon-scented Fern
<i>Oxalis acetosella</i>	Wood-sorrel
<i>Pedicularis sylvatica</i>	Lousewort
<i>Picea sitchensis</i>	Sitka Spruce
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed
<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Pinguicula vulgaris</i>	Common Butterwort
<i>Pinus sylvestris</i>	Scots Pine
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Poa annua</i>	Annual Meadow-grass
<i>Poa humilis</i>	Spreading Meadow-grass
<i>Polygala serpyllifolia</i>	Heath Milkwort
<i>Potentilla erecta</i>	Tormentil
<i>Potentilla sterilis</i>	Barren Strawberry
<i>Primula vulgaris</i>	Primrose
<i>Prunella vulgaris</i>	Selfheal
<i>Pteridium aquilinum</i>	Bracken
<i>Ranunculus acris</i>	Meadow Buttercup
<i>Ranunculus flammula</i>	Lesser Spearwort
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rubus chamaemorus</i>	Cloudberry
<i>Rubus saxatilis</i>	Stone Bramble
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex obtusifolius</i>	Broad-leaved Dock
<i>Sagina procumbens</i>	Procumbent Pearlwort
<i>Sagina subulata</i>	Heath Pearlwort
<i>Salix aurita</i>	Eared Willow
<i>Salix caprea</i>	Goat Willow
<i>Salix cinerea</i>	Grey Willow
<i>Saxifraga stellaris</i>	Starry Saxifrage
<i>Scorzoneroide autumnalis</i>	Autumn Hawkbit
<i>Selaginella selaginoides</i>	Lesser Clubmoss
<i>Sorbus aucuparia</i>	Rowan

<i>Stellaria alsine</i>	Bog Stitchwort
<i>Stellaria holostea</i>	Greater Stitchwort
<i>Succisa pratensis</i>	Devil's-bit Scabious
<i>Taraxacum agg.</i>	Dandelion
<i>Teucrium scorodonia</i>	Wood Sage
<i>Thymus polytrichus</i>	Wild Thyme
<i>Trichophorum germanicum</i>	Deergrass
<i>Trifolium repens</i>	White Clover
<i>Tussilago farfara</i>	Colt's-foot
<i>Urtica dioica</i>	Common Nettle
<i>Vaccinium myrtillus</i>	Bilberry
<i>Vaccinium oxycoccos</i>	Cranberry
<i>Vaccinium vitis-idaea</i>	Cowberry
<i>Valeriana dioica</i>	Marsh Valerian
<i>Valeriana officinalis</i>	Common Valerian
<i>Veronica chamaedrys</i>	Germander Speedwell
<i>Veronica officinalis</i>	Heath Speedwell
<i>Viola lutea</i>	Mountain Pansy
<i>Viola palustris</i>	Marsh Violet
<i>Viola riviniana</i>	Common Dog-violet

#### Bryophytes

<i>Andreaea rupestris</i>
<i>Aneura pinguis</i>
<i>Anthelia julacea</i>
<i>Aulacomnium palustre</i>
<i>Barbilophozia floerkei</i>
<i>Brachythecium plumulosum</i>
<i>Brachythecium rivulare</i>
<i>Breutelia chrysocoma</i>
<i>Bryum pseudotriquetrum s.l.</i>
<i>Calliergon cordifolium</i>
<i>Calliergon sarmentosum</i>
<i>Calliergon stramineum</i>
<i>Calliergonella cuspidata</i>
<i>Calyptogeia muelleriana</i>
<i>Campylium stellatum s.l.</i>
<i>Campylopus atrovirens</i>
<i>Campylopus flexuosus</i>
<i>Campylopus introflexus</i>
<i>Cephalozia bicuspidata</i>
<i>Chiloscyphus polyanthos s.l.</i>
<i>Climacium dendroides</i>
<i>Cratoneuron filicinum</i>
<i>Ctenidium molluscum</i>
<i>Dichodontium palustre</i>
<i>Dicranum scoparium</i>

<i>Diplophyllum albicans</i>
<i>Drepanocladus revolvens</i>
<i>Eurhynchium praelongum</i>
<i>Fontinalis antipyretica</i>
<i>Fontinalis squamosa</i>
<i>Gymnomitrium obtusum</i>
<i>Hygrohypnum ochraceum</i>
<i>Hylocomium splendens</i>
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>
<i>Hypnum jutlandicum</i>
<i>Jungermannia exsertifolia</i>
<i>Lophocolea bidentata</i>
<i>Lophozia ventricosa</i>
<i>Mylia anomala</i>
<i>Mylia taylorii</i>
<i>Odontoschisma sphagni</i>
<i>Palustriella commutata</i> s.l.
<i>Pellia endiviifolia</i>
<i>Philonotis fontana</i>
<i>Plagiomnium undulatum</i>
<i>Plagiothecium undulatum</i>
<i>Platyhypnidium riparioides</i>
<i>Pleurozium schreberi</i>
<i>Pogonatum aloides</i>
<i>Pogonatum urnigerum</i>
<i>Polytrichum commune</i>
<i>Polytrichum juniperinum</i>
<i>Polytrichum piliferum</i>
<i>Polytrichum strictum</i>
<i>Pseudoscleropodium purum</i>
<i>Ptilidium ciliare</i>
<i>Racomitrium aciculare</i>
<i>Racomitrium fasciculare</i>
<i>Racomitrium heterostichum</i> s.l.
<i>Racomitrium lanuginosum</i>
<i>Rhytidiadelphus loreus</i>
<i>Rhytidiadelphus squarrosus</i>
<i>Rhytidiadelphus triquetrus</i>
<i>Scapania undulata</i>
<i>Scleropodium purum</i>
<i>Scorpidium scorpioides</i>
<i>Sphagnum angustifolium</i>
<i>Sphagnum capillifolium</i> s.l.
<i>Sphagnum capillifolium</i> subsp. <i>rubellum</i>
<i>Sphagnum contortum</i>
<i>Sphagnum cuspidatum</i>
<i>Sphagnum denticulatum</i>
<i>Sphagnum fallax</i>
<i>Sphagnum fimbriatum</i>
<i>Sphagnum girgensohnii</i>

<i>Sphagnum magellanicum</i>
<i>Sphagnum palustre</i>
<i>Sphagnum papillosum</i>
<i>Sphagnum russowii</i>
<i>Sphagnum squarrosum</i>
<i>Sphagnum subnitens</i>
<i>Sphagnum tenellum</i>
<i>Sphagnum teres</i>
<i>Thuidium tamariscinum</i>
<i>Warnstorfia exannulata</i>
<i>Warnstorfia fluitans</i>

#### Lichens

<i>Cetraria islandica</i>
<i>Cladonia impexa</i>
<i>Cladonia arbuscula</i>
<i>Cladonia rangiferina</i>
<i>Cladonia uncialis</i>
<i>Cladonia floerkeana</i>
<i>Sphaerophorus</i> spp.

**Appendix 8.11 – Results from Bat Activity Surveys**

Transect	Date	Species	Location	Activity
<b>Gillesbie</b>				
1	15/05/2018	<i>Pipistrellus</i> <i>Pipistrellus pygmaeus</i>	NY 1601 9248 NY 1601 9248	Commuting Commuting
1	25/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> Unidentified pipistrelle Unidentified pipistrelle <i>Pipistrellus pygmaeus</i> x 4 Unidentified <i>Myotis</i> sp <i>Pipistrellus pygmaeus</i>	NY 15840 93430 NY 15840 93430 NY 15840 93430 NY 16509 94206 NY 16238 94506 NY 16238 94506 NY 15807 94435	Commuting Commuting Commuting Feeding Feeding Feeding Commuting
1	09/08/2018	<i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> Unidentified <i>Myotis</i> sp	NY 15753 93633 NY 15753 93633 NY 14145 94027 NY 16734 94151 NY 16803 44125 NY 17337 94005 NY 17077 94176	Feeding Feeding Commuting Commuting Feeding/Commuting Commuting Commuting
1	15/10/2018	<i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i>	NY 15789 93581 NY 15870 93601	Commuting Commuting
<b>2 Laverhay</b>				
2	14/05/2018	<i>Pipistrellus pipistrellus</i> Unidentified pipistrelle	NY 1477 9861 NY 1537 9669	Feeding Commuting
2	12/06/2018	<i>Nyctalus noctula</i> x 2 <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 8 <i>Pipistrellus pipistrellus</i> x 8 <i>Pipistrellus pygmaeus</i> x 16 Unidentified pipistrelle x 6	NY 14528 97561 NY 14849 97669 NY 15355 97054 NY 15459 97727 NY 15396 97183 NY 15124 98700 Records distributed along edge of Laverhay Forest until track/sheepfold from previous grid point	Commuting/feeding Commuting Commuting Commuting Commuting Feeding/Commuting/Social Feeding/Commuting/Social
2	09/08/2018	<i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 6 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 9 <i>Pipistrellus pygmaeus</i> x 2 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 6	NY 15260 98514 NY 15260 98514 NY 15135 98701 NY 15135 98701 NY 14962 98621 NY 14962 98621 NY 14962 98621 NY 14746 98608 NY 14538 98595	Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting
2	15/10/2018	No bats recorded		
<b>3 Dundoran</b>				
3	14/05/2018	Unidentified <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2	NY 13374 98642 NY 13348 97965 NY 13348 97965	Commuting Commuting Commuting

		<i>Pipistrellus pipistrellus</i> x 9 <i>Pipistrellus pygmaeus</i> x 16 Unidentified pipistrelle x 5 <i>Myotis</i> sp <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> x 10 <i>Pipistrellus pygmaeus</i> x 21 Unidentified pipistrelle x 7	NY 13253 97271 NY 13253 97271 NY 13253 97271 NY 13253 97271 NY 13164 96991 NY 13164 96991 Leithenhall Farm Leithenhall Farm Leithenhall Farm	Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting/Social
3	12/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 5	NY 13331 97639 NY 13254 97275	Commuting Commuting
<b>4 Ruegill</b>				
4	17/05/2018	<i>Pipistrellus pipistrellus</i> <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i>	NT 16601 01403 NT 16601 01403 NT 16920 00299	Feeding Feeding Commuting
4	04/06/2018	<i>Pipistrellus pygmaeus</i>	NY 17002 99928	Commuting
4	26/06/2018	<i>Pipistrellus pipistrellus</i>	NT 16710 00570	Commuting
4	25/07/2018	<i>Pipistrellus pipistrellus</i>	NT 16530 01091	Commuting
4	27/08/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 9	NT 15941 00828 NT 16530 01091	Commuting Feeding/Commuting
<b>5 Three Mullach</b>				
5	17/05/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i>	NY 17042 97223 NY 17042 97223 NY 16388 98530 NY 16671 98476	Feeding/Social Feeding/Social Feeding Commuting
5	04/06/2018	<i>Pipistrellus pygmaeus</i>	NY 16534 98659	Feeding
5	26/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i>	NY 16105 99074 NY 16124 99050 NY 16124 99049 NY 16157 99011 NY 16352 98552 NY 16567 98211 NY 16351 98108 NY 17032 97276 NY 17016 97326	Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting
5	27/08/2018	<i>Pipistrellus pipistrellus</i> x 4 <i>Pipistrellus pygmaeus</i> x 4 <i>Nyctalus noctula</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 10	NY 16289 98676 NY 16289 98676 NY 16289 98676 NY 16289 98676 NY 16350 98556 NY 16350 98556 NY 16350 98556 NY 16326 98931 NY 16326 98931 NY 16562 98655 NY 16601 98229 NY 16507 98282 NY 16507 98282 NY 16471 98363 NY 16471 98363 NY 16593 98054	Commuting Commuting Commuting Feeding/Commuting Commuting Commuting Commuting Commuting Commuting Commuting/social Commuting/social Commuting Commuting Commuting Commuting Commuting Commuting



		<i>Pipistrellus pygmaeus</i> x 4 <i>Pipistrellus pipistrellus</i> x 9 <i>Pipistrellus pygmaeus</i> x 9 Unidentified pipistrelle x 4 Unidentified pipistrelle x 3 <i>Pipistrellus pipistrellus</i> x 10 <i>Pipistrellus pygmaeus</i> x 9 <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> x 5 <i>Pipistrellus pygmaeus</i> x 4 Unidentified pipistrelle x 4 <i>Pipistrellus pipistrellus</i> x 19 <i>Pipistrellus pygmaeus</i> x 14 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 11 <i>Pipistrellus pygmaeus</i> x 13 Unidentified pipistrelle <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> x 18 <i>Pipistrellus pygmaeus</i> x 13 Unidentified pipistrelle x 9 Unidentified <i>Myotis</i> sp x 4 <i>Pipistrellus pipistrellus</i> x 17 <i>Pipistrellus pygmaeus</i> x 9 <i>Pipistrellus pipistrellus</i> x 36 <i>Pipistrellus pygmaeus</i> x 9 Unidentified pipistrelle x 4 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pygmaeus</i> Unidentified pipistrelle x 2 <i>Pipistrellus pipistrellus</i> x 11 <i>Pipistrellus pygmaeus</i> x 11 Unidentified pipistrelle x 2	NY 16593 98054 NY 16591 97939 NY 16591 97939 NY 16591 97939 NY 16568 97513 NY 16568 97513 NY 16568 97513 NY 16568 97513 NY 16619 97099 NY 16619 97099 NY 16619 97099 NY 16896 97032 NY 16896 97032 NY 16896 97032 NY 17040 97264 NY 17040 97264 NY 17040 97264 NY 17040 97264 NY 16965 97494 NY 16965 97494 NY 16965 97494 NY 16965 97494 NY 16965 97494 NY 16984 97755 NY 16984 97755 NY 16858 97962 NY 16858 97962 NY 16858 97962 NY 16615 98207 NY 16615 98207 NY 16615 98207 NY 16613 98208 NY 16613 98208 NY 16613 98208	Commuting Com, feed and social Com, feed and social Com, feed and social Com, feed and social Com, feed and social Com, feed and social Commuting Commuting Commuting Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Com, feed and social Com, feed and social Commuting Commuting Com, feed and social Com, feed and social Com, feed and social Com, feed and social Commuting Commuting Com, feed and social Com, feed and social Com, feed and social Com, feed and social Commuting Commuting Feeding/Commuting Commuting Commuting Commuting Feeding/Commuting Commuting Commuting Feeding/Commuting Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting
5	02/10/2018	<i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i>	NY 16037 98773 NY 16102 98786 NY 16192 98822	Commuting Commuting Commuting
6	15/05/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i>	NY 17771 94486 NY 17844 94603 NY 17601 95513 NY 17349 97213	Commuting Feeding/Commuting Commuting Commuting
6	11/07/2018 Walk round part	<i>Pipistrellus pipistrellus</i> x 54 <i>Pipistrellus pygmaeus</i> x 11 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 12 <i>Pipistrellus pygmaeus</i> x 2 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 32 <i>Pipistrellus pygmaeus</i> x 9 Unidentified <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i> x 5	NY 18033 95193 NY 18033 95193 NY 18033 95193 NY 17914 95272 NY 17914 95272 NY 17914 95272 NY 17727 95435 NY 17727 95435 NY 17727 95435 NY 17727 95435	Com, feed and social Feeding/Commuting Feeding/Commuting Com and social Com and social Com and social Com, feed and social Com, feed and social Com, feed and social Commuting Com and social

		<i>Pipistrellus pygmaeus</i> x 7 Unidentified <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i> x 11 <i>Pipistrellus pygmaeus</i> x 3 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 4	NY 17729 95435 NY 17729 95435 NY 17523 95669 NY 17523 95669 NY 17523 95669 NY 17219 95803 NY 17219 95803 NY 17215 95797	Com and social Commuting Commuting Commuting Commuting Commuting Feeding/Commuting Commuting
6	11/07/2018 Drive round	<i>Pipistrellus pipistrellus</i> x 24 <i>Pipistrellus pygmaeus</i> x 7 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pygmaeus</i> x 2 Unidentified <i>Myotis</i> sp <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i>	NY 17907 94680 NY 17907 94680 NY 18038 94851 NY 18140 95078 NY 18140 95078 NY 18140 95078 NY 18140 95078 NY 18156 95266	Com, feed and social Com, feed and social Commuting Commuting Com and social Commuting Commuting
6	25/07/2018 Drive round	<i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> x 4 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 4 <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 6 <i>Pipistrellus pygmaeus</i> x 13	NY 18332 95231 NY 18115 95081 NY 18028 95213 NY 18028 95213 NY 17891 95253 NY 17729 95164 NY 17729 95164 NY 17734 95418 NY 17521 95685 NY 17521 95685 NY 17164 95885 NY 17299 96350 NY 17416 96766 NY 17327 96747 NY 17327 96747 NY 17196 96715	Commuting Commuting Feeding/Commuting Feeding/Commuting Commuting Commuting Commuting Commuting Feeding/Commuting Commuting Commuting Commuting Feeding/Commuting Commuting Commuting Feeding/Commuting Feeding/Commuting
6	02/10/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pygmaeus</i> x 4 <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> X 2	NY 18103 95079 NY 18103 95079 NY 17741 95381 NY 17741 95381 NY 17255 95786 NY 17194 96706 NY 17304 97220 NY 17304 97220	Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Commuting Commuting Commuting Commuting
6	02/10/2018	<i>Pipistrellus pipistrellus</i> x 5 <i>Pipistrellus pygmaeus</i> x 7 Unidentified pipistrelle x 4 <i>Pipistrellus pipistrellus</i> x 13 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 12 <i>Pipistrellus pygmaeus</i> x 8 <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i>	NS 18070 94925 NS 18070 94925 NS 18070 94925 NS 18332 95290 NS 18332 95290 NS 18411 95649 NS 18411 95649 NS 17612 96911 NS 17523 96934 NS 17300 97208	Com, feed and social Com, feed and social Com, feed and social Com, feed and social Com, feed and social Com, feed and social Com, feed and social Feeding/Commuting Commuting Commuting

**Appendix 8.12 – Results of Bat Records from Static Detectors**

Date	Detector Number	Species	Number of Passes
<b>Cluster 1 Dundoran</b>			
30/05/2018 to 04/06/2018	1 (Dundoran)	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	6 10 32 3
	2 (Burnt Mound)	No bat activity	-
	3 (Broadfield Height)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	205 75 29
	4 (Craig Fell)	<i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	7 58 2 2
<b>Cluster 2 Gillesbie</b>			
Spring 05/06/2018 to 12/06/2018	1 (Gudewife’s Hill)	No bat activity recorded	-
	2 (Sembletree Burn)	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	29 179 3912 16
	3 (Gillesbie Hill)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	54 67 47
	4 (VP1)	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i> <i>Plecotus auritus</i>	6 4 548 398 177 1
<b>Cluster 2 Gillesbie</b>			
Summer 25/07/18 to 01/08/18	1(Gudewife’s)	<i>Unidentified Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	3 21 89 12
	2 (Sembletree Burn)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 39
	3	No bat activity	-
	4 (VP1)	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	3 27 55 49 22
<b>Cluster 2 Gillesbie</b>			
Autumn 02/09/2018 to 07/09/2018	1	No bat activity	-
	2	No bat activity	-

	3	No bat activity	-
	4	No bat activity	-
<b>Cluster 3 Ramshaw Rig</b>			
Spring 21/05/18 to 29/05/18	1 (Finniegill)	<i>Pipistrellus pipistrellus</i>	2
	2 (Rue Gill)	No bat activity	-
	3 (Dryfe valley)	No bat activity	-
	4 (R’Shaw Rig)	No bat activity	-
<b>Cluster 3 Ramshaw Rig</b>			
Summer 16/07/18 to 24/07/18	1 (Finniegill)	<i>Pipistrellus pipistrellus</i>	1
	2 (Rue Gill)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	217 2
	3 (Dryfe valley)	No bat activity	-
	4 (R’Shaw Rig)	<i>Unidentified Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i>	2 4 1
<b>Cluster 3 Ramshaw Rig</b>			
Autumn 03/10/18 to 15/10/18	1	No bat activity	-
	2	No bat activity	-
	3	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	6 7 1
	4	<i>Myotis sp</i>	3
<b>Cluster 4 Silton Forest</b>			
Spring 14/05/18 to 18/05/18	1 (LBKnowe)	No bat activity	-
	2 (Shed)	No bat activity	-
	3(Bog relic)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 1
	4 (old VP6)	No bat activity	-
<b>Cluster 4 Silton Forest</b>			
Summer 13/06/2018 to 18/06/2018	1	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	2 66 5 3
	2	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	5 11
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	13 4 1
	4	<i>Pipistrellus pipistrellus</i>	5
<b>Cluster 4 Silton Forest</b>			
Summer 10/07/18 to 16/07/18	1	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i> <i>Plecotus auritus</i>	87 9 396 95 40 3

	2	<i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	2 82 68 8
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	20 153 1
	4	No bat activity	-
<b>Cluster 4 Silton Forest</b>			
2 Autumn 7/08/18 to 07/09/2018	1 (Shed)	<i>Myotis species</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 29 15
	2 (LBknowe)	<i>Myotis species</i> <i>Myotis natterii</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Plecotus auritus</i>	4 3 17 21 4 1
	3 (Bog relic)	<i>Myotis species</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	4 1 16 39
	4 (Old VP6)	No bat activity	-
<b>Cluster 5 South Loch Fell</b>			
Summer 2019 27/06/2019 to 06/07/2019	1 (Dun Moss)	<i>Pipistrellus pipistrellus</i>	4
	2 (S Loch Fell)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	89 17
<b>Cluster 5 South Loch Fell</b>			
Late summer 2019 16/07/2019 to 27/07/2019	1 (Dun Moss)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	4 6 1

	2 (S Loch Fell)	<i>Myotis species</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	1 3 3
<b>Cluster 6 Three Mullach Hill</b>			
Spring 2019 16/04/2019 to 26/04/2019	1	No bat activity	-
	2	No bat activity	-
	3	No bat activity	-
	4	No bat activity	-
<b>Cluster 6 Three Mullach Hill</b>			
Summer 2019 21/08/2019 to 31/08/2019	1( North T M Hill)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Plecotus auritus</i>	3 22 34 3
	2 (Track edge)	<i>Myotis species</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus sp (50kHz)</i>	3 4 303 447 25
	3 (South T M Hill)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus sp (50kHz)</i>	2 89 138 17
	4 (track edge west)	No bat activity	-
<b>Cluster 6 Three Mullach Hill</b>			
Autumn 2019 10/09/2019 to 20/09/2019	1	No bat activity	-
	2	No bat activity	-
	3	No bat activity	-
	4	No bat activity	-

**Appendix 8.13 – Total Number of Bat Passes per Month**

Key: Pip = pipistrelle species, Ppip = Common Pipistrelle, Ppyg = Soprano Pipistrelle, NYC = Noctule, MYO = Myotis species, BLE = Brown Long-eared

Detector and area of survey	May	June	July	August	September	October
<b>Dundoran</b>		30/05/18 to 04/06/18				
	-	378 (7 Nyc, 6 Myo, 365 Pip)	-	-	-	-
<b>Gillesbie</b>		05/06/2018 to 12/06/2018	25/07/18 to 01/08/18			
	-	5438 (1BLE, 4 Nyc, 35 Myo, 5398 Pip)	156 (6 Myo, 27 Nyc, 123 Pip)	-	0	-
<b>Ramshaw Rig</b>	21/05/18 to 29/05/18		16/07/18 to 24/07/18			03/10/18 to 15/10/18
	2 (Ppip)	-	227 (4 Nyc, 2 Myo, 221 Ppip, 2 Ppyg)	-	-	17 (9 Myo, 7 Ppip, 1 Ppyg)
<b>Silton Forest</b>	14/05/18 to 18/05/18	13/06/2018 to 18/06/2018	10/07/18 to 16/07/18		27/08/18 to 07/09/2018	
	2 (Pip)	115 (2 Myo, 113 Pip)	964 (87 Myo, 11 Nyc, 866 Pip)	-	155 (12 Myo, 18 Nyc, 125 Pip)	-
<b>South Loch Fell (2019)</b>		27/06/2019 to 06/07/2019	16/07/2019 to 27/07/2019			
	-	110 (Pip)	18 (4 Nyc, 1 Myo, 13 (Pip)	-	-	-
<b>Three Mullach Hill (2019)</b>	16/04/2019 to 26/04/2019			27/08/2019 to 31/08/2019	10/09/2019 to 20/09/2019	
	0	-	-	1090 (9 Nyc, 3 BLE, 3 Myo, 1075 Pip)	0	-

**Appendix 8.14 – Summary of Otter Evidence (non-sensitive data)**

Evidence	Number on Map	Grid Reference	Location
Recent print in mud on track above culvert	1	NY 10070 98575	On track out to old Nether Murthat quarry
Recent spraint on rock at inside of confluence	2	NY 10136 98541	Near railway line west of old Nether Murthat quarry
Fresh spraint on grassy mound, right bank of burn	3	NY 10189 98421	Along Dead Burn near railway line west of Nether Murthat quarry
One recent spraint	4	NY 10627 98297	On rock on left bank of Dead Burn near confluence with R. Annan
Spraint	5	NY 15595 95655	On bank of Sembletree Burn
Spraint	6	NT 16974 00363	On bank of Dryfe Water north of Dryfehead Bothy
Otter spraint and Badger dung on same on same bit of moss	7	NT 16968 00307	On bank of Dryfe Water north of Dryfehead Bothy
Otter slide	8	NT 16984 00301	On bank of Dryfe Water north of Dryfehead Bothy
1 recent spraint	9	NY 17050 99866	At crossing of Dryfe Water south of Dryfehead Bothy
2 recent spraints and 1 fresh spraint	10	NY 17154 99765	On western bank of Dryfe Water south of Dryfehead Bothy
1 fresh 2 recent	11	NY 17157 99761	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint	12	NY 17201 99675	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint and 1 fresh spraint	13	NY 17188 99567	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint	14	NY 17227 99563	On western bank of Dryfe Water south of Dryfehead Bothy
Spraint	15	NY 17279 99439	On western bank of Dryfe Water south of Dryfehead Bothy
Otter slide	16	NY 17187 96713	On western bank of Dryfe Water south of Dryfehead Bothy
1 fresh spraint and four old spraints	17	NY 17196 96710	On eastern bank of Dryfe Water south of Dryfehead Bothy
Spraint	18	NY 17785 96415	At edge of plantation on lower eastern slopes of Macmaw Hill
1 recent spraint and 1 fresh spraint	19	NY 17336 99320	On eastern bank of Dryfe Water south of Dryfehead Bothy
Prints	20	NY 18588 94976	On eastern bank of Cocklaw Burn
2 old spraints and 1 fresh spraint	21	NY 18824 95449	On eastern bank of Waterhead Burn below culvert
1 fresh spraint	22	NY 19640 95501	On western bank of Murthat Burn east of Little Brown Knowe
2 recent spraints	23	NY 19743 94036	On bank of Murthat Burn where it meets forestry track

**Appendix 8.15 – Summary of Badger Evidence (non-sensitive data)**

Location	Feature
NY 15088 98622	Dung and foraging signs
NY 14750 98569	Foraging signs
NY 14638 98635	Path
NT 12446 00509	Latrine
NY 18248 99018	Latrine
NY 18664 94751	Latrine
NY 18687 94751	Dung
NY 18402 95463	Dung
NY 18105 95080	Dung
NY 17187 95910	Latrine
NY 18071 94848	Foraging signs
NY 18077 94780	Latrine
NY 17966 94971	Latrine
NY 16748 98744	Dung
NT 17077 00036	Foraging signs
NT 17349 00327	Foraging signs
NT 17420 00502	Dung
NT 17191 00682	Dung
NT 17151 00789	Dung
NT 17021 00743	Dung
NT 17297 00594	Dung
NT 17361 00987	Dung
NT 17448 01409	Dung
NT 17440 01158	Foraging signs
NT 17491 01012	Dung and foraging signs
NY 15566 99596	Dung
NY 15373 99188	Dung
NY 18717 96318	Dung
NY 18823 96252	Dung
NY 18810 96109	Dung
NY 20065 95963	Dung
NY 19523 95742	Dung
NY 19576 95627	Dung
NY 19390 95667	Dung
NY 19337 95614	Dung
NY 19714 94901	Dung
NY 19685 94771	Dung
NT 16979 00336	Dung
NT 17034 00127	Path, at either side of watercourse
NY 17341 99165	Dung

NY 17315 99367	Dung
NY 17262 99424	Foraging signs
NY 17325 98805	Dung
NT 17044 00117	Path
NY 17078 99882	Dung and path
NT 17020 00221	Dung and path
NT 16974 00286	Signs of aggressive encounter between Badger and Otter
NY 18789 94386	Latrine and foraging signs
NY 19387 93051	Path and foraging signs
NY 18948 93548	Foraging signs
NY 18783 93525	Foraging signs
NY 18567 93936	Foraging signs and path
NY 18248 98916	Latrine and path leading south
NT 13506 00157	Foraging signs
NT 16857 04850	Latrine
NT 16138 01098	Dung
NY 12858 98783	Foraging signs
NY 12836 99008	Dung and path
NY 12836 99136	Foraging signs
NY 12927 99330	Foraging signs
NY 12934 99458	Foraging signs
NY 13107 99481	Foraging signs and dung
NY 13277 99371	Foraging signs and dung
NT 17182 04938	Dung and path
NT 17337 05353	Latrine with two well-used pits beside path
NY 16924 94430	Foraging signs
NY 18444 95581	Lots of foraging signs
NY 18860 96183	Foraging signs
NY 19011 96000	Foraging signs, including dug-out bee nest
NY 16347 94584	Lots of foraging signs
NY 16386 94554	Latrine with one pit and fresh dung
NT 11748 00400	Latrine with seven well-used pits
NY 11119 99338	Print in mud beside field gate
NY 13809 99805	Path leading out of wood onto moor
NY 13782 99949	Path leading out of wood onto moor
NT 16419 00428	Path
NY 13524 99180	Foraging signs
NY 18834 94516	Extensive foraging recorded here throughout 2 years of survey

**Appendix 8.16 – Common Lizard Sightings**

Grid Reference
NT 14902 02601
NY 16233 85637



**Appendix 8.17 – Results of Electrofishing Surveys****Dryfe Water Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
De7	52.6	0	28.4	6.9
De0.5	0	0	0	0
DeSl1	15.5	0	99.4	6.2
DeCe1	16.2	0	39.2	10.8
De3	13	0	56.1	6.7
De4	3.3	0	77.2	5.8
De8	19.8	2.6	25.8	6.0
De9	14.9	1.5	55.2	6.0

**Wamphray Water Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Wy0.5	0.0	0.0	9.6	7.9
Wy1	0.0	0.0	3.8	1.0
Wy2	0.0	0.0	1.9	4.0
Wy3	102.6	3.6	30.3	7.0
Wy4	243.5	7.0	49.7	0.0
Wy5	133.8	1.0	12.4	0.0
Wy6	0.0	0.0	3.0	3.0
Wy 7	0.0	0.0	1.2	3.0
Wy8	205.0	5.9	35.3	1.0
Wy9	337.4	1.5	82.1	0.0

## Appendix 8.18 – Important Ecological Features (IEFs) – Habitats

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDTE Sensitivity
A1.1.1 Semi-natural broad-leaved woodland	W9 <i>Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis</i> woodland W7 <i>Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum</i> woodland W11 <i>Quercus petraea-Betula pubescens-Oxalis acetosella</i> woodland	<b>National (Dryfe Water SSSI)/local</b> Part of the habitat is protected by SSSI designation.  UK BAP priority habitats: 'Upland oak wood, upland birch woods' and 'Upland mixed ashwoods'.  D&G LBAP priority habitat.	LOW Semi-natural cleuch woodland in general lends significant diversity to the otherwise open habitats of typical open upland areas. There are several small fragments within the site along the margins of the watercourses. In view of the small size of the habitat, it has only local value. Dryfe Water SSSI, an example of 'Upland mixed ashwood', must be considered separately to have national value as it has been chosen as one of the best examples of this habitat type.	Low (W9, W11)  High (W7)
A1.1.2 Broad-leaved plantation woodland	-	<b>Very local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Broadleaved and Mixed Plantations' under the heading 'Highly modified habitats'	LOW The habitat as present within the site has only been very recently established and therefore has little or no woodland plants in the field layer. The new plantation areas provide some additional ecological diversity (foraging and nesting habitat for birds and shelter for small mammals and invertebrates). This habitat is of local value.	-
A1.2.2 Coniferous plantation	-	<b>Local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Coniferous Woodland' under the heading 'Highly modified habitats'	LOW This is by far the largest habitat type in the site, covering around 3080ha when combined with A4.2 below. It is lacking in botanical diversity since most of the woodland has no woodland ground flora. It supports a suite of common bird species and provides breeding habitat, shelter for mammals and foraging edge for bats. It supports a small Red Squirrel and Pine Marten population. Sheltered grassland areas along track edges and marshy grassland rides within the forest support numbers of butterflies such as Common Blue, Scotch Argus and Small Pearl-bordered Fritillary. The habitat has very recently supported one breeding pair of Goshawk up until the felling of the trees at the nest site. Since its value to that important species is extremely variable, connected to the cycle of suitable stands of mature trees, this habitat is of local value.	-
A1.3.2 Mixed plantation	-	<b>Very local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Broadleaved and Mixed Plantations' under the heading 'Highly modified habitats'	LOW The habitat as present within the site has only been very recently established and therefore has little or no woodland plants in the field layer. The new mixed plantation areas provide additional ecological diversity (foraging habitat for birds and shelter for small mammals and invertebrates).	-
A2 Scrub	W1 <i>Salix cinerea-Galium palustre</i> woodland 'WSx' scrub  W21 <i>Crataegus monogyna-Hedera helix</i> scrub	<b>Local</b> W1 <i>Salix cinerea-Galium palustre</i> woodland is referable to  UK BAP priority habitat 'Wet woodland' District/County  D&G LBAP priority habitat 'Scrub Woods'	LOW This habitat is scattered throughout the site on the lowest slopes and riparian edge of the watercourses, and small un-mappable stands are found along several stretches of forestry access tracks in the east of the site. At these various locations it lends a small but useful contribution to the ecological mosaic. This habitat is of local value.	Low (W21, 'WSx')  Moderate (W1)
A4.2 Recently-felled coniferous woodland	-	<b>Very local</b> No conservation status for this habitat	LOW This habitat is generally rather poor floristically. There can be a temporary establishment of species such as foxglove and rosebay willowherb. Some ecological niches may be temporarily created for species such as pied wagtail, nesting in crevices in rock piles or overhangs. Clear fell can form part of habitat mosaics supporting nightjar, but this species has not established itself at the site.	-

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDE Sensitivity
B1.1 Unimproved acid grassland	U4 <i>Festuca ovina-Agrostis capillaris-Galium saxatile</i> grassland  U5 <i>Nardus stricta-Galium saxatile</i> grassland  U6 <i>Juncus squarrosus-Festuca ovina</i> grassland	<b>Local</b> D&G LBAP priority habitat	LOW Acid grassland is the most extensive open habitat within the study area for the wind farm and is common and widespread in the uplands of Dumfries and Galloway. The habitat is generally species-poor due to heavy grazing over a long period. The habitat contributes to the open upland habitat mosaic. The grassland directly supports ground-nesting birds such as skylark and meadow pipit. This habitat has local value.	Low
B5 Marsh/marshy grassland	M23 <i>Juncus effusus/acutiflorus-Galium palustre rush-pasture</i>  M25 <i>Molinia caerulea-Potentilla erecta mire</i>	<b>Local</b> UK BAP priority habitat Upland flushes, fens and swamps.  Regarded as a habitat of National importance but Local at this site.	LOW Marshy grassland is the second largest open habitat after acid grassland. Most of the habitat that is located on ground accessible to grazing animals is rather species-poor. There are some examples that are more species-rich, such as along the watercourses in the eastern plantations. The habitat contributes to the ecological mosaic and supports the Scotch Argus butterfly at several locations within the survey area.	Low (M25)  Moderate or high at some locations (M23)
C1 Bracken	U20 <i>Pteridium aquilinum-Galium saxatile</i> community	<b>Local</b> No conservation status for this habitat	LOW Bracken is widespread on the lower slopes of the hills, most extensively in the western part of the site. It is assessed to be of local value, providing shelter for mammals and invertebrates and, in places, nesting habitat for significant bird species such as stonechat and whinchat.	Low
C3.2 Non-ruderal tall herb and fern	U16 <i>Luzula sylvatica-Vaccinium myrtillus</i> tall herb community  U19 <i>Oreopteris limbosperma-Blechnum spicant</i> community	<b>Very local</b> No conservation status for this habitat	LOW Stands of these tall herb and fern habitat types are scarce within the site. Where they occur, they are not extensive, but do provide some additional diversity to the ecological mosaic, providing shelter for mammals, invertebrates and, in some cases (U19), shade for woodland plants.	Low
D1.1 Dry dwarf shrub heath	H10 <i>Calluna vulgaris-Erica cinerea</i> heath  H12 <i>Calluna vulgaris-Vaccinium myrtillus</i> heath  H18 <i>Vaccinium myrtillus-Deschampsia flexuosa</i> heath	<b>Regional</b> Annex I Habitat European Dry Heaths  UK BAP Upland heaths  D&G LBAP priority habitat D 1.1/D2/E1.6.1/E1.7/E1.8, but to much lesser effect, B1.1 acid grassland in the NW and NE is the core of the golden eagle habitat.	MEDIUM Dry heath is one of the larger open habitats on the site (occupying c303ha) and also forms a component of D5 Dry heath/acid grassland mosaic (c51ha). Taken together with the amount of E1.8 Dry modified bog dominated by heather (there is much habitat at this site that is intermediate between the two) it accounts for a large proportion of the less-grazed north-western and north-eastern parts of the site. The habitat is not typical of the best quality heaths and is rather species-poor, but it has particular significance at this site as an important part of golden eagle foraging habitat.	Low
D2 Wet dwarf shrub heath	M15 <i>Trichophorum cespitosum-Erica tetralix</i> wet heath	<b>County/District</b> Annex I North Atlantic wet heaths with <i>Erica tetralix</i>  UK BAP upland heaths  D&G LBAP priority habitat  Recognised as being of International value but of <b>county or district</b> value at this site	LOW Wet heath (c150ha) occupies a much smaller proportion of the site than the related bog habitats and the extensive dry heath. It occurs to the margins of bog habitats on damp slopes on thinner peat and forms a component in several areas of wet heath/acid grassland mosaic (D6 c33ha) where heather has been reduced by grazing over time. It adds to the important mosaic of open upland habitats at the site as a component of the golden eagle foraging habitat.	Low

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDE Sensitivity
E1.6.1 Blanket bog	M2 <i>Sphagnum cuspidatum/fallax</i> bog pool community  M3 <i>Eriophorum angustifolium</i> bog pool community  M17 <i>Trichophorum germanicum-Eriophorum vaginatum</i> mire  M18 <i>Erica tetralix-Sphagnum papillosum</i> mire  M19 <i>Calluna vulgaris-Eriophorum vaginatum</i> mire  M20 <i>Eriophorum vaginatum</i> mire	<b>County</b> Annex I Blanket bogs  UK BAP Blanket bog  D&G LBAP priority habitat  Recognised as being of International value but of <b>County</b> value at this site	MEDIUM Blanket bog rich in <i>Sphagnum</i> mosses accounts for a relatively small proportion of the open upland habitats (c90ha) compared to E1.8 Dry modified bog (see below). It is confined to small and fragmented sections scattered throughout the site at locations where the ground has escaped heavy grazing or drainage over time. The habitat is a significant component within the important mosaic of upland habitats within the study area and lends much ecological diversity.	Low
E1.7 Wet modified bog	M17 <i>Trichophorum germanicum-Eriophorum vaginatum</i> mire  M20 <i>Eriophorum vaginatum</i> mire  M25 <i>Molinia caerulea-Potentilla erecta</i> mire  (and transitional communities)	<b>County</b> International (Blanket bog)  UK BAP Blanket bog	MEDIUM Wet modified bog is not at all extensive within the site (c32ha) but lends some ecological diversity as part of an important suite of open upland habitats.	Low
E1.8 Dry modified bog	M20 <i>Eriophorum vaginatum</i> mire	<b>County</b> Annex I Blanket bogs  UK BAP Blanket bog	MEDIUM Dry modified bog (c313ha) is the most extensive open habitat after acid grassland in the windfarm survey area. Although this category represents the most degraded type of blanket bog on the site, it is still a vital component of the overall resource and would be capable of enhancement given suitable management.	Low
E2.1 Acid/neutral flush	M4 <i>Carex rostrata-Sphagnum fallax</i> mire  M6 <i>Carex echinata-Sphagnum fallax/denticulatum</i> mire	<b>Local</b>  National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	LOW This habitat is not diverse botanically, but it contributes to the ecological mosaic and supports invertebrates and upland birds particularly in winter months.	Moderate at some locations
E2.2 Basic flush	M10 <i>Carex dioica-Pinguicula vulgaris</i> mire	<b>Very local</b> National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	LOW There is only one small example of this habitat within the site. It is quite distinctive and rather uncommon in the uplands. It provides a little additional ecological diversity.	High
E2.3 Bryophyte-dominated spring	M37 <i>Palustriella commutatum-Festuca rubra</i> spring	<b>Very local</b>  National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	Only a few small examples (too small to map) of this habitat were found within the study area. They lend some distinctive additional ecological diversity to the ecological mosaic.	High

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDTE Sensitivity
F1 Swamp, marginal and inundation	S9 <i>Carex rostrata</i> swamp	<b>Very local</b> National (UK BAP 'Lowland fens' Upland flushes, fens and swamps') D&G LBAP priority habitat	LOW There is only one small area of swamp within the site which adds a little ecological variety to the surrounding agricultural land.	Low
G1 Standing water	-	<b>Very local/local</b> National (UK BAP, Oligotrophic lakes, ponds)	LOW There are only two small ponds within the site. They add a little ecological variety to the surrounding mires and grasslands. There is the large lagoon on the western approach route, on the west side of the Annan.	-
G2 Running water	-	<b>Regional</b> National (UK BAP, 'Rivers habitat') D&G LBAP priority habitat	MEDIUM The River Annan is a major river in the south west of Scotland and the burns in the site are important as corridors both within the site and leading to the outside of it. These features have regional value.	-
I1.1.1 Inland cliff	-	<b>Very local</b> UK BAP Inland Rock Outcrop and Scree Habitats D&G LBAP priority habitat	LOW This habitat is very limited in its extent within the study area, being confined to a small areas on Glengap Shank. It provides a very small additional ecological niche in the open upland habitat mosaic.	-
I1.2.1 Scree	-	<b>Local</b> UK BAP Inland Rock Outcrop and Scree Habitats D&G LBAP priority habitat	LOW This habitat is very limited in its extent within the study area, being confined to areas in the north-west of the study area, around Gallatae, Craig Fell, Glengap Head and the Glengap Burn valley. It lends a little diversity to the open upland habitat mosaic. It is often used for loafing by golden eagle.	-
J1.2 Amenity grassland	-	<b>Negligible</b> UK Broad Habitat: 'Improved grassland'	LOW A very small area of amenity grassland is present within the study area, where there are mown areas in the vicinity of the dwelling houses at Finniegill and at Dryfehead Bothy. This habitat is of negligible value to conservation.	-
J1.3 Ephemeral/short perennial	-	<b>Very local</b> UK Broad Habitats: 'Arable and horticulture' or 'Built-up areas and gardens'	LOW Only a small area of this habitat was found within the survey area. It provides a little additional ecological value.	-
J4 Bare ground	-	<b>Negligible</b> (No conservation status)	NEGLIGIBLE This habitat type has been used to represent access track area, hard-standing or disturbed areas – at the time of survey - such as feeding stations. It is of negligible value.	-



**Appendix 8.19 – Important Ecological Features (IEFs) – Species**

Species	Conservation Importance	Legal status	Nature Conservation Evaluation
Bats: Common pipistrelle Soprano pipistrelle Myotis sp Noctule Bat Brown Long-eared Bat	High (National)	Fully protected under the W & CA 1981 and the EU Habitats Directive (EPS)	Soprano Pipistrelle: UK BAP, Dumfries & Galloway LBAP Scottish Biodiversity List and EPS; Common Pipistrelle, Noctule, Brown Long-eared bat, and Whiskered Bat Myotis mystacinus: Dumfries & Galloway LBAP Scottish Biodiversity List and EPS
Otter	High (National)	Fully protected under the W & CA 1981 and the EU Habitats Directive (EPS)	UK BAP Dumfries & Galloway LBAP Scottish Biodiversity List
Common Lizard	High (National)	Protected against killing under the W & CA 1981	UK BAP
Migratory salmonids,	High (National)	Atlantic Salmon protected under Schedule 3 of the EU Habitats Directive (EPS)	UK BAP Dumfries and Galloway LBAP (apart from Trout) Scottish Biodiversity List
Badger	Medium (Regional)	Protection of Badgers Act 1992	Dumfries & Galloway LBAP Scottish Biodiversity List
Red Squirrel	Medium (Regional)	Red squirrels and their dreys receive full protection under Schedules 5 and 6 of the Wildlife and Countryside Act 1981 (as amended).	UK BAP Scottish Biodiversity List Dumfries & Galloway LBAP
Pine Marten	Low (Local)	Full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Schedule 3 of the EU Habitats Directive (EPS)	UK BAP Scottish Biodiversity List
Roe deer and Red Deer	Low (Local)	Protected under the Deer (Scotland) Act 1996	Red Deer listed as High Importance in Dumfries and Galloway LBAP associated with Grassland and Heathland habitats and both Red and Roe associated with woodland habitats. Scottish Biodiversity List
Large Heath	Low (Local)	Partially protected by Section 9, Parts 5(a) and 5(b) of the Wildlife and Countryside Act 1981 (as amended).	UK BAP Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats

Scotch Argus butterfly	Low (Local)	-	Listed as High Importance in Dumfries and Galloway LBAP associated with Purple Moor Grass and Rush Pastures habitats.
Small Heath butterfly	Low (Local)	-	UK BAP Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with Calcareous grassland habitats.
Small Pearl-bordered Fritillary	Low (Local)	-	UK BAP Priority Species Scottish Biodiversity List Local Priority Species in Dumfries and Galloway LBAP
Common Frog	Low (Local)	Protected by Section 9(5) of the Wildlife and Countryside Act 1981	Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats
Common Toad	Low (Local)	Protected by Section 9(5) of the Wildlife and Countryside Act 1981	UK BAP priority species Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats

**Appendix 8.20 – Dimensions used in Habitat Loss Calculations**

<b>Feature</b>	<b>Final Dimensions</b>	<b>Dimensions used for Habitat Loss</b>
Turbine Foundations	18 x 18	28 x 28
Access Track	5m running width	10 width (to include cabling)
Crane Hardstanding	1500m <sup>2</sup>	1925m <sup>2</sup>
Borrow-pits	1000m <sup>2</sup>	1000m <sup>2</sup>
Temporary construction/site storage compounds	Variable to suit design	As mapped in GIS
Junctions	Variable to suit design	As mapped in GIS

**Appendix 8.21 – Loss of Habitat Types**

Habitat Type	Extent of Habitat Present (ha)	Loss of Habitat (ha)	Percentage Loss (%)
A1.1.1 Semi-natural broad-leaved woodland	42.6	0.031059	0.07
A1.1.2 Broadleaved plantation woodland	75.4	0.000442	N/A
A1.2.2 Coniferous plantation	2374.1	43.14194	1.8
A1.3.2 Mixed plantation	15.8	0	N/A
A2.1 Scrub	16	0.030413	0.19
A4.2 Recently-felled coniferous woodland	706.7	15.44949	2.18
B1.1 Unimproved acid grassland	891.9	10.81521	1.2
B1.2 Semi-improved acid grassland	262	2.447603	0.93
B2.1 Unimproved neutral grassland	12.8	0.045151	0.35
B2.2 Semi-improved neutral grassland	18	0.381429	2.11
B4 Improved grassland	78.4	1.299541	1.65
B5 Marsh/marshy grassland	396	3.813413	0.96
B6 Poor semi-improved grassland	89	2.517106	2.83
C1 Bracken	130.3	0.490006	0.38
C3.1 Ruderal tall herb and fern	0.5	0	N/A
C3.2 Non-ruderal tall herb and fern	0.04	0	N/A
D1.1 Dry dwarf shrub heath	302.7	2.015631	0.66
D2 Wet dwarf shrub heath	150.1	3.13741	2.1
D5 Dry heath/acid grassland mosaic	51.2	0.532175	1.0
D6 Wet heath/acid grassland mosaic	32.9	0.606671	1.84
E1.6.1 Blanket bog	89.5	3.413799	3.81
E1.7 Wet modified bog	31.7	0.811312	2.56
E1.8 Dry modified bog	312.6	14.21992	4.55
E2.1 Acid/neutral flush	0.5	0	N/A
E2.2 Basic flush	<0.1	0	N/A
E2.3 Bryophyte-dominated spring	<0.1	0	N/A
F1 Swamp	0.2	0	N/A
G1 Standing water	0.7	0	N/A
G2 Running water	N/A	0	N/A
I1.1.1 Inland cliff	0.06	0	N/A
I1.2.1 Scree	2.2	0	N/A
J1.2 Amenity grassland	0.5	0	N/A
J1.3 Ephemeral/short perennial	0.6	0	1.3
J4 Bare ground	5.72	0.141072	2.47
	8572.8	105.3408 Total loss	1.23

**Appendix 8.22 – Developments within the Natural Heritage Zone**

Wind Farm	Number of turbines	Distance from Scoop Hill (km)
Operational/under construction		
Hopsrig	12	8
Minnygap	10	9
Ewehill and Extension	22	9.5
Harestanes	68	10
Minsca	16	12.5
Craig	4	14
Clyde	152	17
Dalswinton	15	20
Clyde Extension	57	20
Consented		
Crossdykes	15	7.5
Lion Hill	4	15.9
Solwaybank	15	16.2
Crookedstane Farm	4	18.8
Planning		
Loganhead	8	8
Earlshaugh	24	13
Faw Side	45	15
Whitelaw Brae	14	16

**Appendix 8.23 – Residual Effects**

Feature and Type of Disturbance	Significance without Mitigation	Proposed Mitigation/Enhancement	Residual Significance
<b>Designated Sites</b>	No impacts	No impacts	No impacts
<b>Habitats</b>	<p>Loss of blanket bog, wet modified bog and dry modified <b>low magnitude</b>, of <b>minor significance</b> and <b>permanent</b>.</p> <p>Loss of most habitats, <b>low</b> in <b>magnitude</b> and of <b>minor significance</b></p> <p>No direct loss of any <b>GWDTE</b></p> <p>During construction, many negative impacts will be negligible however some such as the drying of bog habitats and water pollution are considered to be negative, of <b>medium magnitude</b>, <b>permanent</b> and of <b>moderate significance</b> and <b>reversible</b>.</p> <p>Operational impacts <b>low magnitude</b>, <b>long term</b> and of <b>minor significance</b> and reversible.</p>	<p>Site turbines, access tracks and other infrastructure on habitats of lowest value, where possible, overseen by ECoW. Floating roads where necessary to cross sensitive wetland habitats.</p> <p>Habitat retention, management, and creation.</p>	<p>Extremely unlikely to have a long-term negative effect, therefore <b>low magnitude</b> and of <b>minor significance</b>.</p>
<b>Species</b>			
<b>Bats</b>	<p>Impact on roosts <b>low magnitude</b>, <b>short term</b>, of <b>minor significance</b> and <b>reversible</b>.</p> <p>The effects of construction <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>During operation, due to risk of collision, negative impacts <b>medium magnitude</b>, <b>long term</b> and <b>moderate significance</b></p>	<p>Limit working to daylight hours only to avoid need for artificial lighting.</p> <p>Ensure turbine blade tips are a minimum of 50m from the edge of woodland.</p> <p>Provide bat boxes in suitable locations.</p>	<p>Improved roosting opportunities.</p> <p>Impacts reduced to <b>low magnitude</b> and of <b>minor significance</b>.</p> <p>Potential for some <b>positive</b> impact through provision of bat boxes and other habitat enhancements away from turbines.</p>
<b>Otters</b>	<p><b>Negligible</b> negative impact due to direct habitat loss.</p> <p>Construction impacts on</p>	<p>Pre-construction surveys. 30m buffer around holts, potential holts and lie-ups;</p> <p>Minimise water crossings;</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p>Potential for positive</p>

	<p>protected structures <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>However, negative impacts of <b>medium magnitude</b>, <b>short term</b> and of <b>moderate significance</b> due to potential pollution of watercourses.</p> <p>Operational impacts <b>negligible</b>.</p>	<p>Implement of strict pollution prevent measures;</p> <p>All staff to be briefed on otter structures;</p> <p>Retain scrub/woodland along watercourses;</p> <p>Cap culverts/pipes if stored overnight on site; and</p> <p>Cover excavations &gt;0.5m deep or provide ramp, also temporary exclusion fencing.</p>	<p>impact through planting along watercourses.</p> <p>Therefore <b>negligible magnitude</b> and <b>not significant</b></p>
<b>Badgers</b>	<p>Habitat loss <b>low magnitude</b>, <b>long term</b> and of <b>minor significance</b></p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operational impacts <b>low magnitude</b>, <b>permanent</b> and of <b>minor significance</b>.</p>	<p>Preconstruction surveys;</p> <p>30m buffer around setts, license if 100m from borrow pits;</p> <p>Cover excavations (see otter);</p> <p>Enhancement planting;</p> <p>All staff to be briefed on badger setts;</p> <p>Forestry operators to be briefed on sett locations.</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p>Some possible <b>positive</b> impact through improved foraging opportunities.</p>
<b>Red Squirrel</b>	<p>Habitat loss <b>negligible</b>.</p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operating impacts <b>negligible</b>.</p>	<p>Pre construction surveys for dreys;</p> <p>Woodland management.</p>	<p><b>Negligible</b> impacts</p>
<b>Pine Marten</b>	<p>Habitat loss <b>negligible</b>.</p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operating impacts <b>negligible</b>.</p>	<p>Pre construction surveys for dreys;</p> <p>Woodland management.</p>	<p><b>Negligible</b> impacts</p>
<b>Common lizard</b>	<p>Loss of habitat <b>low magnitude</b>, <b>long term</b> and of <b>low significance</b>.</p> <p>Construction effects <b>medium magnitude</b>, <b>short term</b> and of <b>moderate significance</b>.</p> <p>Operational impacts <b>negligible</b>.</p>	<p>Ground clearance out with breeding season, site checks for reptiles, hibernaculum cleared late summer, new ones constructed.</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p><b>Negligible magnitude</b> and <b>not significant</b>.</p>



Migratory Fish	Construction effects of <b>high magnitude, long term</b> and of <b>major significance</b> .	Implementation of strict pollution prevention measures; Ensuring there is no impedence to fish from new culverts or bridges.	<b>Low magnitude of minor significance and temporary</b> impacts.
Amphibians	Effects of construction <b>low magnitude of minor significance</b> . The effects of the operational wind farm are considered <b>negligible</b> .	Ground clearance out with breeding season, ponds created for amphibians.	Impact considered negligible with some <b>positive</b> effects.
Butterflies and moths	The loss of habitat <b>negligible</b> and the effects of construction and operation are also considered to be <b>negligible</b> .	Habitat enhancement.	Impact considered negligible with some <b>positive</b> effects.
<b>Cumulative Impacts</b>			
Habitats and species	Generally of low magnitude and low significance.	Following mitigation outlined above.	Mainly <b>insignificant negative impacts</b> , at worst <b>low magnitude of minor significance</b> and some positive impacts.
<b>decommissioning Impacts</b>			
Habitats and species	Slight negative cumulative impacts could occur at the local level.	Site will be assessed at the time of decommissioning and relevant mitigation put in place.	<b>Insignificant negative</b> impacts.
<b>Cumulative Impacts</b>			
Habitats and species	Generally of low magnitude and low significance.	Following mitigation outlined above.	Mainly <b>insignificant negative impacts</b> , at worst <b>low magnitude of minor significance</b> and some positive impacts.
<b>Decommissioning Impacts</b>			
Habitats and species	Slight negative cumulative impacts could occur at the local level.	Site will be assessed at the time of decommissioning and relevant mitigation put in place.	<b>Insignificant negative</b> impacts.

## Appendix 8.24a Dryfe Water: Electrofishing Survey

Written by River Annan District Salmon Fishery Board

February 2019

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### 1: Introduction

- 1.1 The Dryfe Water rises at an altitude of 585m above sea-level on the Southern slope of Loch Fell (NT316975 604300). The watercourse flows south and south-westwards for 29.3km before joining the main River Annan 3km to the west of Lockerbie (NY 310800 582050). The Dryfe Water is one of eight main tributaries that joins the mainstem of the River Annan and ranks as the fifth largest tributary in the catchment.
- 1.2 The River Annan District Salmon Fishery Board has collected extensive habitat and fish population data across the Dryfe Water catchment since 1997. Our database comprises of instream and riparian habitat assessments conducted by walkover habitat surveys along 26.8 km mainstem Dryfe Water and a further 12.3km of six key tributaries. In addition, a total of 102 electrofishing surveys with site specific habitat assessments have been undertaken between 1997 and 2018.
- 1.3 For the purpose of this report a total of eight electrofishing sites were surveyed within suitable areas of fish habitat throughout the proposed wind farm site. The Dryfe Water flows on the eastern side of the Scoop Hill wind farm site (NY 316800 595300). The objective of the surveys is to give an indication of the importance of the Dryfe Water in the vicinity of Scoop Hill for fish ecology and provide a baseline to assess any future changes in habitat or fish populations.
- 1.4 The aims of the study were as follows:
- Undertake electrofishing surveys at eight sites on the Dryfe Water
  - Analyse data obtained during the electrofishing surveys, presenting the results
  - Survey and assess river habitat information from each electrofishing site
  - Briefly comment on results and their suitability for detecting potential threats to fish populations and river ecology in general

### 2: Methodology

#### Data Recording

- 2.1 The River Annan District Salmon Fishery Board (RADSFB) is a partner in the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Scottish Executive Freshwater Fisheries Laboratory, The Tweed Foundation, the Spey Research Trust, the Tay Foundation and the River Conon District Salmon Fishery Board. This group has, in partnership, developed a set of agreed methodologies and record sheets for use with electrofishing surveys and an associated database in which to record information gathered from such surveys. The electrofishing surveys undertaken have been completed to the standards that are required by the partners of the SFCC and recorded using the formats agreed by this group.

#### Electrofishing Equipment

- 2.2 Backpack apparatus was employed during all electrofishing surveys. This equipment is powered by a double 12v lead-acid battery with a variable voltage output (generally 200 – 250 volts for the purposes of electrofishing surveys). A smooth direct current was used at all sites. The backpack is linked to a cathode of

braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.

#### Electrofishing techniques

- 2.3 Electrofishing was undertaken by a team of three SFCC accredited RADSFB staff at all survey sites using semi-quantitative single pass methodology. Electrofishing involves the surveyors passing a current through the water, which temporarily affects the fish's behaviour. When subjected to the current they exhibit a reaction known as forced swimming and swim towards the anode and are captured. The method of fishing involves the anode operator drawing stunned fish downstream to a banner net held against the current by an assistant. Normally direct current is used as this enables the use of high currents without causing untoward damage to the fish. Once captured, the fish recover in a holding container. They are then anaesthetised using a recognised fish anaesthetic (MS222), identified, measured (selected species) and recorded, and once recovered, returned unharmed to the area from which they were captured. The team works its way across and upstream the chosen area, systematically surveying all the watercourse within the selected section.

#### Age Determination

- 2.4 All juvenile salmonids are measured to the nearest millimetre. Length/frequency graphs can then illustrate year classes within the population. Age determination of individual fish can then be made by assessment of their length in relation to the entire population and the length frequency graphs. For discussion purposes, 0+ fry is the young of the fish that have hatched during spring of that survey year. Following their first winter fry develop into the parr stage and may remain in tributaries for additional 3 years, possibly longer as some fish may adapt a non-migratory life history. Parr populations will be considered collectively as 1++ for the remainder of this report. Electrofishing data sheet appendices contain the detailed length frequency graphs that quantify fish density relative to individual year class.

#### Habitat Assessment

- 2.5 At each site an assessment was made of the instream habitat available for 1++ parr stage salmonids. This assessment graded instream cover present as none, poor, moderate, good or excellent. This grading provides an index of instream cover where diverse substrate compositions will score more favourably than areas of uniform smaller substrate providing poor cover. In accordance with SFCC protocols % estimates of depths, substrate type and flow type were made at each site. Additionally, % estimates of the quantity of the bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation were made. Site habitat assessments and descriptions can be found in section 3.2.

#### Survey Measurement

- 2.6 At each site surveyed a total length was recorded and average wet and dry widths calculated. The average wet width was calculated from four - five individual widths recorded at equidistant intervals from the top of the site (0m) to the bottom. The length of each site from top to bottom was also noted. From these site lengths and average wet widths, the total area fished was calculated.

### 3: Results

#### Fish Densities & Distribution

- 3.1 Table 1 shows a minimum estimate of fish per 100m<sup>2</sup> (based on actual number of fish captured). At sites where parr (1++ fish) could be categorised into more detailed age classes this is shown in the full site reports in the appendix. For the purposes of this report the estimates of these different age classes of parr were added together to give an overall 1++ estimate.

#### Quintile Ranges

- 3.2 Densities of fish were calculated separately for 0+ fry (fish that have hatched in the year of survey) and 1++ parr (juveniles that have spent at least one winter in freshwater but have not yet been to sea) for salmon and trout. Estimates of minimum density are calculated by dividing the number of fish captured by the area of stream surveyed. To provide a guide to the relative abundance of salmonid fish sampled during the survey, minimum density estimates are classified according to the SFCC classification scheme (Godfrey, 2005) (Table 2 & 3).
- 3.3 This classification system compares minimum fish abundance sampled at 291 sites in the Solway coast region of Scotland and places abundance into six quintile ranges according to stream width at the survey site. Classes A through to E are given for abundance within each quintile range and class F represents the complete absence of fish. The 100th percentile represents the highest density found at any one of the 291 sites compared. Ultimately this system allows us to compare individual site performance against average regional targets to establish the status of fish populations.
- 3.4 The maps in Figures 2, 3, 4 & 5 illustrate the quintile ranges for each site. Quintile ranges are a site condition monitoring methodology based on the electrofishing carried out across the Solway region.

#### Site Habitat Assessments

- 3.5 Full descriptions of the types of habitats found on the survey reaches are available in the appendix. Habitat quality has been assessed on features that are suitable for supporting parr stages of Atlantic salmon. Key features for higher quality habitat are large substrates (Cobble/Boulder) and fast flows (riffle/run).

#### Habitat Descriptions

Table 4 is a summary of the habitat characteristics found at all sites during the 2018 surveys. The full habitat data set is included in the SFCC electrofishing report in the appendix.



**De0.5 (Easting: 316585 Northing: 601385)**

De0.5 is the uppermost site surveyed on the Dryfe Water, it is located on a small tributary called Duncan's Cleugh at an altitude of 357m. It is a very narrow site with an average width of less than a metre and the substrates are dominated by gravel/pebble/cobble, but a few boulders are also present, the overall instream cover is assessed as good. There is a little bankside cover (30% on each bank) in the form of undercutting and draped vegetation which could provide some cover for parr. The site is surrounded by rough sheep grazing and there is little vegetation other than grass, as a result there is no canopy cover or overhanging boughs and therefore no additional cover or shading.

**De3 (Easting: 317050 Northing: 599900)**

De3 is situated slightly downstream of an Irish bridge and sits at an altitude of 300m. Its substrate is predominately gravel/pebble/cobble with almost no boulders present, therefore the instream cover is classed as moderate. It was noticed on the day of survey that the substrate material was partly compacted, this could be attributed to the Irish bridge which slows flows possibly resulting in sediment accumulating in the substrate. There is very little cover provided by the left bank (10%) in the form of draped vegetation however the right bank is very undercut (90%) and has significant draped vegetation (60%) providing valuable parr cover. The site is located amongst scrubland with uniform low vegetation providing no additional fish cover in the form of overhanging boughs or canopy cover, despite this the level of cover on the right bank and the substrate composition could provide habitat for both fry and parr.

**De4 (Easting: 317221 Northing: 598310)**

De4 is at an altitude of 270m and shows some similarities to site De3. The instream cover is rated as moderate and the substrate is primarily gravel/pebble/cobble, though this is somewhat dominated by pebbles (50%). The site also lacks any significantly diverse vegetation or riparian habitat and therefore has no additional cover in the form of overhanging boughs or canopy cover. Unlike De3 however both banks are almost entirely bare of fish cover except from a very slight amount of undercut on the right bank (10%). This lack of bank/overhanging cover combined with the predominately pebble substrate offers limited habitat for parr life stages provides excellent spawning/fry substrates that would be equally suited to both salmon and trout species.

**DeSI1 (Easting: 317172 Northing: 596673)**

DeSI1 is on minor tributary called Stoney Gill which joins the Dryfe Water slightly downstream of a large culvert, the site is located very close to the point at which the tributary joins the main body of the Dryfe. The site is at an altitude of 256m and the instream cover is recorded as good as the substrate is dominated by larger substrates being almost entirely pebble/ cobble/ boulder. The site is surrounded by scrubland and uniform low vegetation, resulting in there being no overhanging boughs or canopy cover, however nearby conifer plantations may provide shading at some points through the day. Both banks however provide fish cover in the form of undercutting and draped vegetation which are present on 60% of each bank.

**De7 (Easting: 317180 Northing: 596644)**

Site De7 is located at an altitude of 254m, on the main body of the Dryfe Water, slightly downstream of the point at which Stoney Gill joins the river. The substrates are dominated by gravel/pebble/cobble and no boulders are present resulting in the instream quality being deemed moderate. The banks provide a high degree of fish cover with both being significantly undercut and supporting draped vegetation (70% on each). All vegetation around the site is assessed as uniform and there is a total lack of overhanging boughs or canopy cover. Dominant land use in the area is a mixture of scrubland and conifer plantations

**DeCe1 (Easting: 317175 Northing: 594684)**

Situated at 207m in altitude, site DeCe1 is on a tributary to the Dryfe Water known as the Capel. DeCe1 has substrates dominated by larger materials pebble/cobble/boulder and the instream cover is rated excellent. In contrast, the banksides are bare of vegetation or any additional fish cover. This is a natural feature of the site which is in a low gradient section of channel with large fluvial deposits of substrate material. The primary land use in the area is broadleaf and mixed woodland, though they are unfortunately at too great a distance from the site to provide any cover.





**De8 (Easting: 317257 Northing: 594658)**

Site De8 is located on a section of river that appears to have been historically straightened, slightly upstream of a large culvert it sits at an altitude of 206m. Substrate composition is dominated by pebble/cobble, but a small number of boulders are also present, as a result the instream cover is classed as good. The bank sides provide very little fish cover with only a little draped vegetation present (10% on each bank), the bank tops however show a high diversity of vegetation with broadleaf and conifer plantations forming the primary land uses. The left bank supports particularly complex vegetation and as a result 90% of the bank is covered by overhanging boughs providing cover and shade. The right bank has no overhanging boughs and the overall canopy cover for the site is 20%.

**De9 (Easting: 318610 Northing: 593994)**

The furthest downstream site sampled in this survey, De9 is located at 203m in altitude and is the first site on the Dryfe Water after it leaves commercial forestry. The instream cover is rated as good and like site De8 the substrates are dominated by pebble/cobble, but some boulders are also present. The banks provide almost no additional fish cover with only a little available, provided by a small amount of draped vegetation present on the left bank (10%). The primary land use around the site is rough pasture and therefore the bank top vegetation is uniform and mainly grass and small shrubs. This results in the site receiving no additional cover by the way of overhanging boughs or canopy cover which are not present.





## 4: Discussion

### 4.1 Habitat and Fish Populations

In its upper reaches, approximately one third of the Dryfe sub-catchment lies within an area of commercial forestry and moorland/rough grazing. Scoop Hill is located in the south west corner of this commercial forestry unit. The lower two thirds of the Dryfe sub-catchment is almost exclusively improved grazing for cattle and sheep with small areas of commercial forestry in the upper reaches of some tributaries.

The instream habitats of the Dryfe Water are dominated by large pebble/cobble substrate and this large tributary provides significant habitat for both salmon and trout throughout its entire reach. The instream and bankside cover within the proposed Scoop Hill Windfarm site can be considered generally good for salmonid species, but riparian bank top cover that creates cover/shading of watercourses is lacking. Although the land use practices are more intensive in its lower reaches the Dryfe Water generally provides good to excellent instream habitat although compaction of substrates can be an issue within modified, straightened sections. Riparian bankside cover is also fragmented and largely lacking in the lower reaches.

We do not consider historical forestry practices to have had any detrimental impact on habitat or water quality on the river environment in proximity to Scoop Hill. All planting and felling operations are within Forestry & Water guidelines.

Relative to other parts of the Annan catchment, juvenile salmonid numbers have remained consistent at sites throughout the Dryfe. We do not believe there are any significant land use pressures in this part of the system but would always advocate the creation of riparian buffer zones.

The geomorphological characteristics of the Dryfe Water create optimal instream habitat features for juvenile Atlantic salmon. There is a good mixture of both spawning/fry substrates and parr habitat at sites De3, De4, De7, De8, De9, site DeCe1 on the Capel burn. DeSl1 and De0.5 are small, high gradient tributaries that may not routinely be used by adult salmon for reproduction but will have inward migration of fry and parr.

Salmon fry densities are classed as good at site De7, fair at sites DeSl1, DeCe1, De8 and De9, very poor at sites De4 and De3 and absent at De0.5. The results indicate all sites except De0.5 are accessible to salmon and that spawning occurred in close proximity to survey sites. It is possible that salmon fry present at DeSl1 will have migrated in from the main channel of the Dryfe. Results from site De7, which is directly downstream from DeSl1, are classed as good and competition for habitat may result in salmon fry entering the Stoney Gill burn in search of new territory.

Salmon parr were absent at sites De3, De4, De7, DeCe1, DeSl1 and De0.5 and classified as very poor at De8 and De9. These results reflect poor adult returns in 2015 & 2016 which resulted in low salmon fry densities (Figure 7). It is likely that the prolonged drought in July 2018 has influenced the distribution of salmon parr which will have been forced to seek refuge in deeper pool habitats. Parr density across the Annan catchment have been low since 2014 and the results in the Scoop Hill area are within reason relative to the performance of other sites with similar characteristics on other tributaries. Although the uppermost site De0.5 is unlikely to be utilised by salmon for reproduction it is possible salmon parr could migrate inwards as large substrates are present.

Trout fry densities were classed as excellent at De3, De4, De9 and DeSl1, good at De8, fair at De7 and DeCe1. It is likely that site De0.5 would support a small population of resident brown trout characterised by population dynamics where fry:parr ratios are equal. However, it is likely any resident trout in Duncan's Cleugh burn had been affected by the prolonged drought conditions in July 2018.

Trout parr densities are classed as either fair or good at all sites, except De0.5 where they were absent. It is likely that the prolonged drought in July 2018 has also influenced the distribution of trout parr and negatively effected densities encountered at electrofishing sites. Given that the high gradient channel features (fast flowing with large substrates) are more suited to salmon and the challenges created by the summer drought, trout parr densities appear to be performing well in this part of the catchment.

Electrofishing results would indicate that all sites except for De0.5 are being utilised by migratory trout as fry numbers are significantly higher than parr. Given that instream habitat characteristics are more suited to salmon with limited marginal habitat, trout populations should be considered to be very healthy. Trout populations across the Annan catchment have improved in 2017 & 2018 following two poor years in 2015 & 2016. Surveys indicate trout densities in 2017 & 2018 are in line with long term averages and the densities indicate trout populations in the upper reaches of the Dryfe Water are attaining adequate stock recruitment levels for the available habitat.

No other native species have been identified during electrofishing surveys conducted in 2018 at sites selected for this survey. Historical records at sites De3, De4, De7, De8 & De9 also indicate no other species were encountered during any surveys conducted between 1997 and 2018. It is possible that European eel should be present, but this species has poor distribution throughout the Annan catchment due to an impassable barrier at the very downstream limit of the main river. There is a statutory requirement for the barrier to be removed or eased by 2026 and once eels can readily ascend the river it is likely they will be present within the Scoop Hill wind farm area. The general habitat features in the upper Dryfe Water (high gradient, fast flows, large substrates) are most suited to salmonids and the absence of other fish species is unsurprising.

### 4.2 Special Conservation Status

- The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.
- Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List.
- There is some protection for brown trout in terms of exploitation controls within fisheries legislation and sea trout are further protected within fisheries acts relating to the protection of 'salmon', which includes the statutory protection provided by District Salmon Fisheries Boards. In 2007 both ancestral brown trout and sea trout were added to the UKBAP Priority Species List.

### 4.3 Summary

Following analysis of the data collected in 2018 and supported by comprehensive historical datasets, the fish ecology and habitat features of the Dryfe Water within proximity to the Scoop Hill wind farm can be summarised as follows;

Our surveys identified a variety of both salmon and trout habitat for the fry and parr stages of both species. Relative to location within the upper reaches of the catchment, habitat quality can be considered optimal for both salmon and migratory trout. The Dryfe Water is a significant nursery for juvenile salmonids with good instream habitat and water quality. Despite long term fluctuations in adult salmon and migratory trout populations, juvenile densities on the Dryfe have remained relatively stable. This can be attributed to high quality instream habitat features which ensures the Dryfe produces enough emigrating salmonids to buffer

for decreased survival in estuarine and marine environments, thus ensuring egg deposition from returning adults is adequate for repopulating available habitat to carrying capacity.

**Table 1: Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
De7	52.6	0	28.4	6.9
De0.5	0	0	0	0
DeSl1	15.5	0	99.4	6.2
DeCe1	16.2	0	39.2	10.8
De3	13	0	56.1	6.7
De4	3.3	0	77.2	5.8
De8	19.8	2.6	25.8	6.0
De9	14.9	1.5	55.2	6.0

**Table 2: Quintile Explanation**

Density Figure Quintile Range	Classification
> 80th percentile to max	Excellent
> 60th percentile to < 80th percentile	Good
> 40th percentile to < 60th percentile	Fair
> 20th percentile to < 40th percentile	Poor
> present to < 20th percentile	Very Poor
Zero	Absent

**Table 3: Fish Density Classification for the Solway Region**

Salmon 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.2	1.0	1.7	0.7
20 <sup>th</sup> Percentile	3.0	6.1	11.7	7.1
40 <sup>th</sup> Percentile	8.4	16.4	19.3	11.7
60 <sup>th</sup> Percentile	19.7	33.9	32.8	22.0
80 <sup>th</sup> Percentile	37.3	54.9	48.4	38.9
100 <sup>th</sup> Percentile	221.4	167.3	125.2	120.3
Salmon 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.8	0.4	0.8	0.5
20 <sup>th</sup> Percentile	2.5	2.9	3.9	2.8
40 <sup>th</sup> Percentile	5.1	5.7	8.2	6.0
60 <sup>th</sup> Percentile	7.8	10.4	11.4	8.8
80 <sup>th</sup> Percentile	11.1	15.3	17.3	13.6
100 <sup>th</sup> Percentile	36.2	33.8	30.6	50.4
Trout 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	0.5	0.8	0.4
20 <sup>th</sup> Percentile	5.6	6.4	4.0	1.4
40 <sup>th</sup> Percentile	19.9	18.4	7.4	3.4
60 <sup>th</sup> Percentile	48.4	32.4	21.8	9.7
80 <sup>th</sup> Percentile	94.6	51.3	32.6	24.0
100 <sup>th</sup> Percentile	415.7	221.4	160.8	100.5
Trout 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	1.2	0.5	0.3
20 <sup>th</sup> Percentile	4.0	3.2	1.7	0.7
40 <sup>th</sup> Percentile	8.4	5.8	3.5	1.1
60 <sup>th</sup> Percentile	11.6	8.1	5.6	2.1
80 <sup>th</sup> Percentile	23.1	15.3	10.0	4.5
100 <sup>th</sup> Percentile	174.2	67.4	204.4	8.8

**Table 4: Habitat Characteristics For All Sites Surveyed in 2018**

Site Code	Average Wet Width (m)	Altitude (m)	Instream Cover	Dominant Substrate	Bankside Cover (%)		Riparian Cover (%)	
					Left Bank	Right Bank	Left Bank	Right Bank
De0.5	0.82	357	Good	Gravel/Pebble/Cobble	30	30	0	0
De3	4.05	300	Moderate	Gravel/Pebble/Cobble	10	90	0	0
De4	6.18	270	Moderate	Gravel/Pebble/Cobble	0	10	0	0
DeSl1	1.58	256	Excellent	Pebble/Cobble/Boulder	60	60	0	0
De7	5.28	254	Moderate	Gravel/Pebble/Cobble	70	70	0	0
DeCe1	3.7	207	Excellent	Pebble/Cobble/Boulder	0	0	0	0
De8	6.65	206	Good	Pebble/Cobble	10	10	90	0
De9	6.88	203	Good	Pebble/Cobble	10	0	0	0



Figure 1 – The Electrofishing Sites Chosen For Fish Monitoring Relating To The Scoop Hill Wind Farm Development

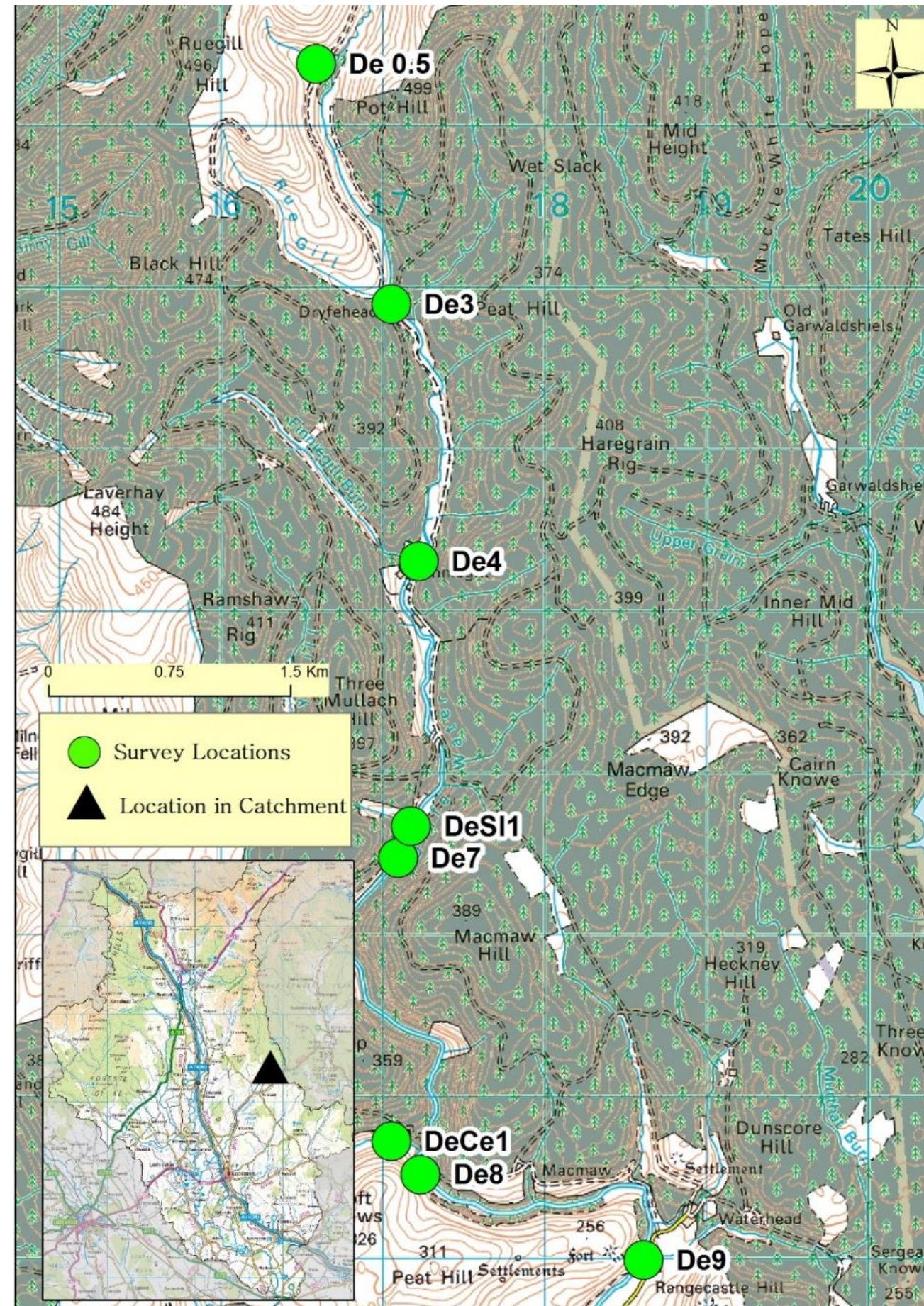




Figure 2 – Quintile Ranges for Salmon Fry Caught in 2018

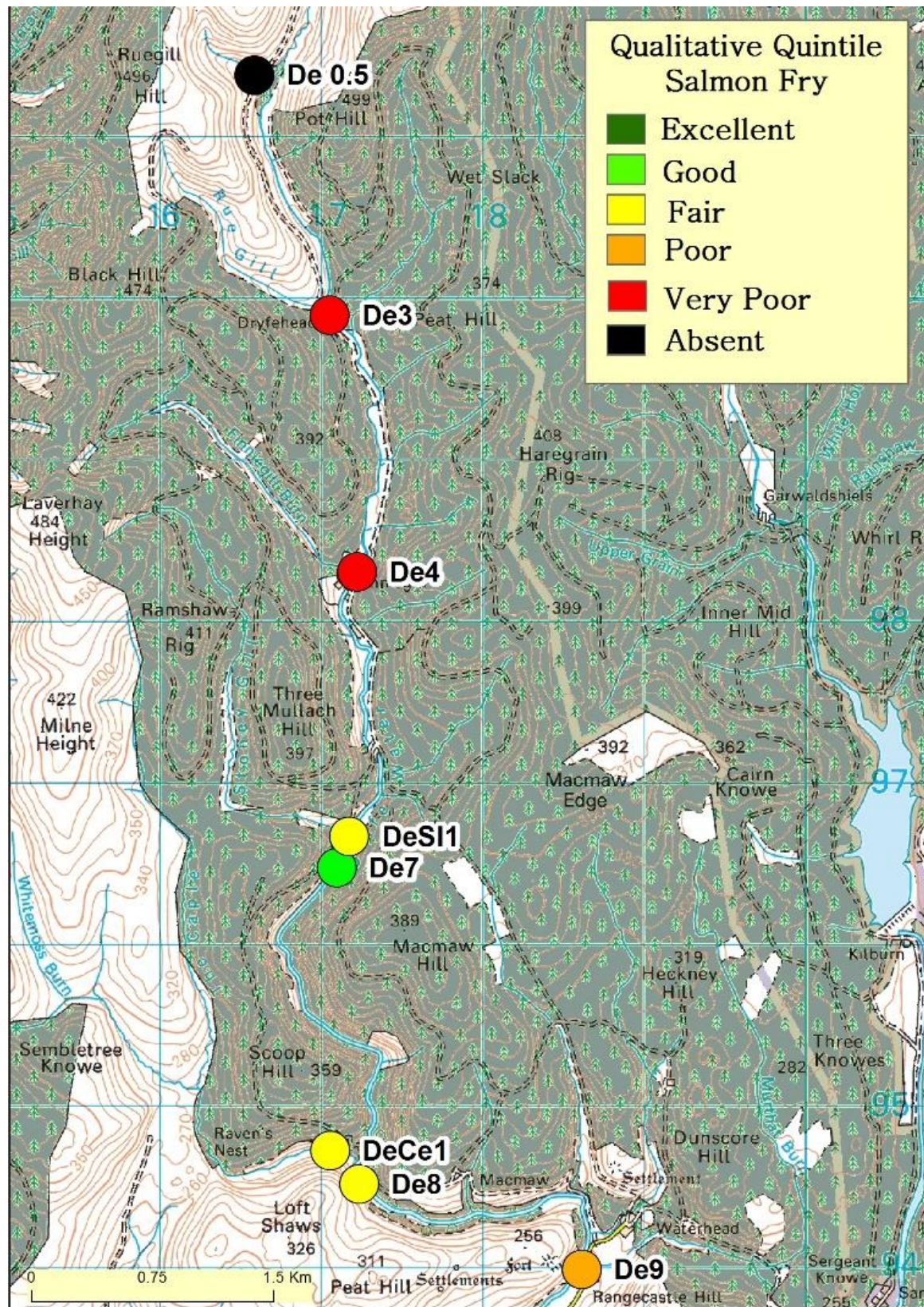


Figure 3 – Quintile Ranges for Salmon Parr Caught in 2018

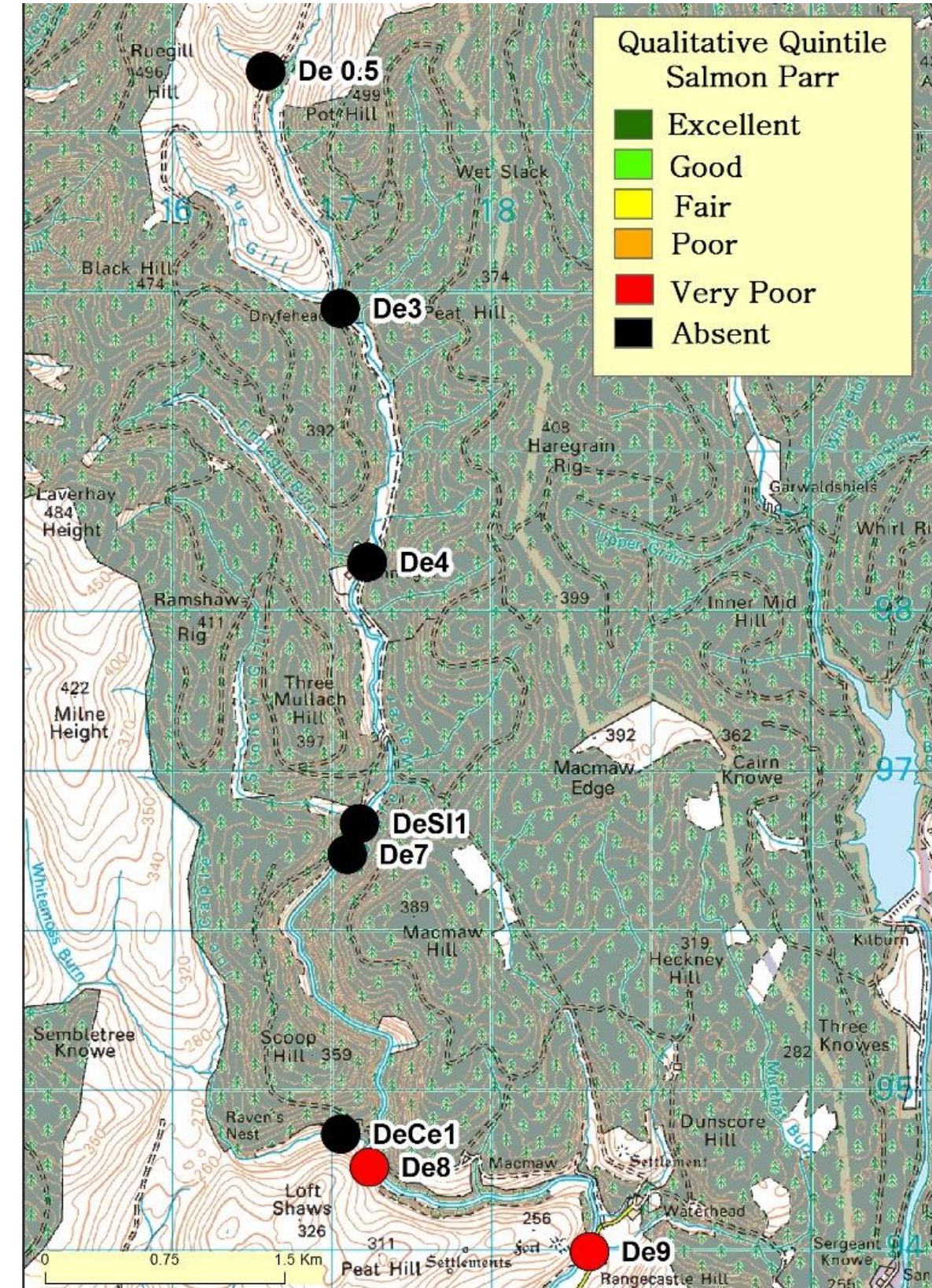




Figure 4 – Quintile Ranges for Trout Fry Caught in 2018

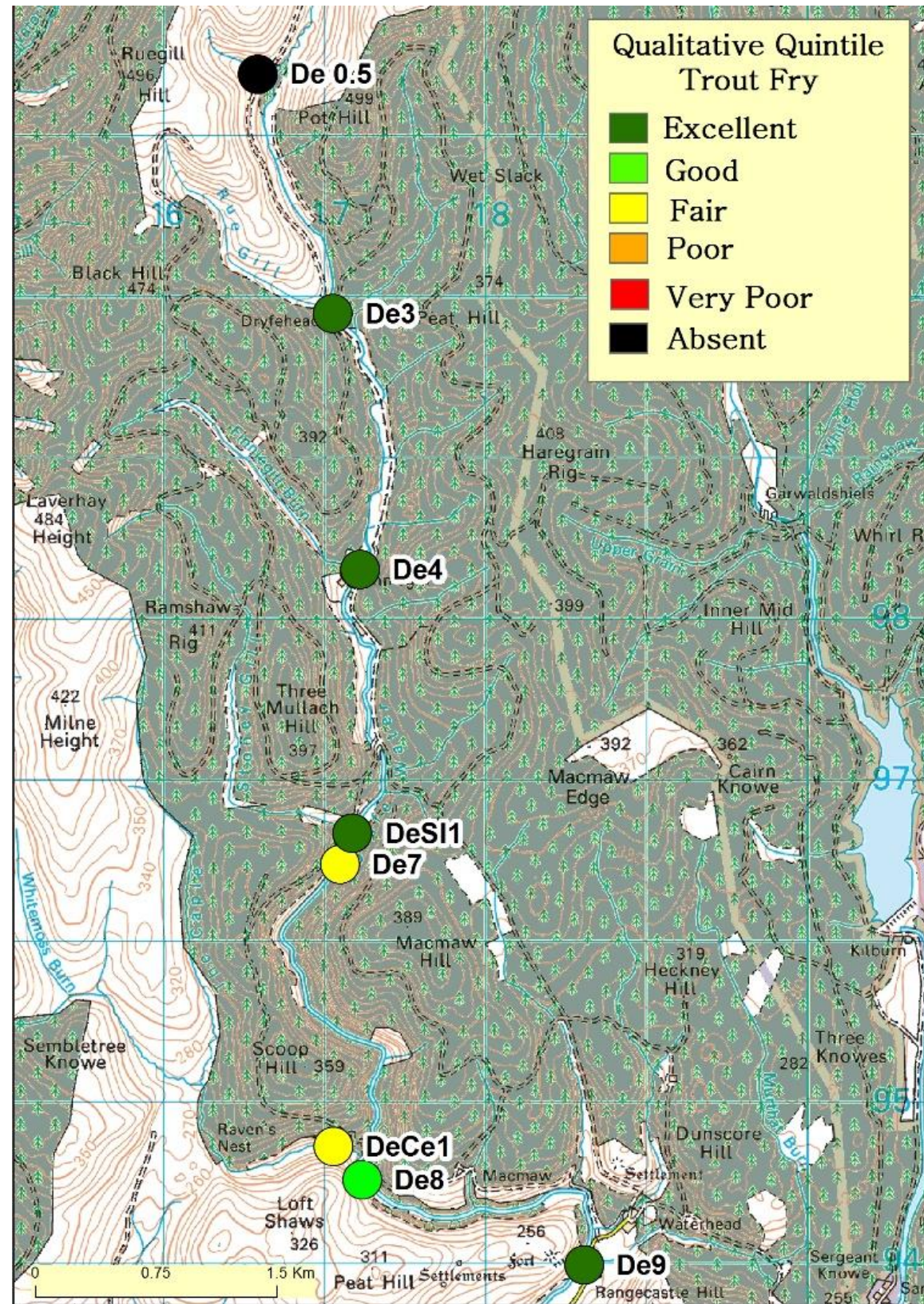


Figure 5 – Quintile Ranges for Trout Parr Caught in 2018

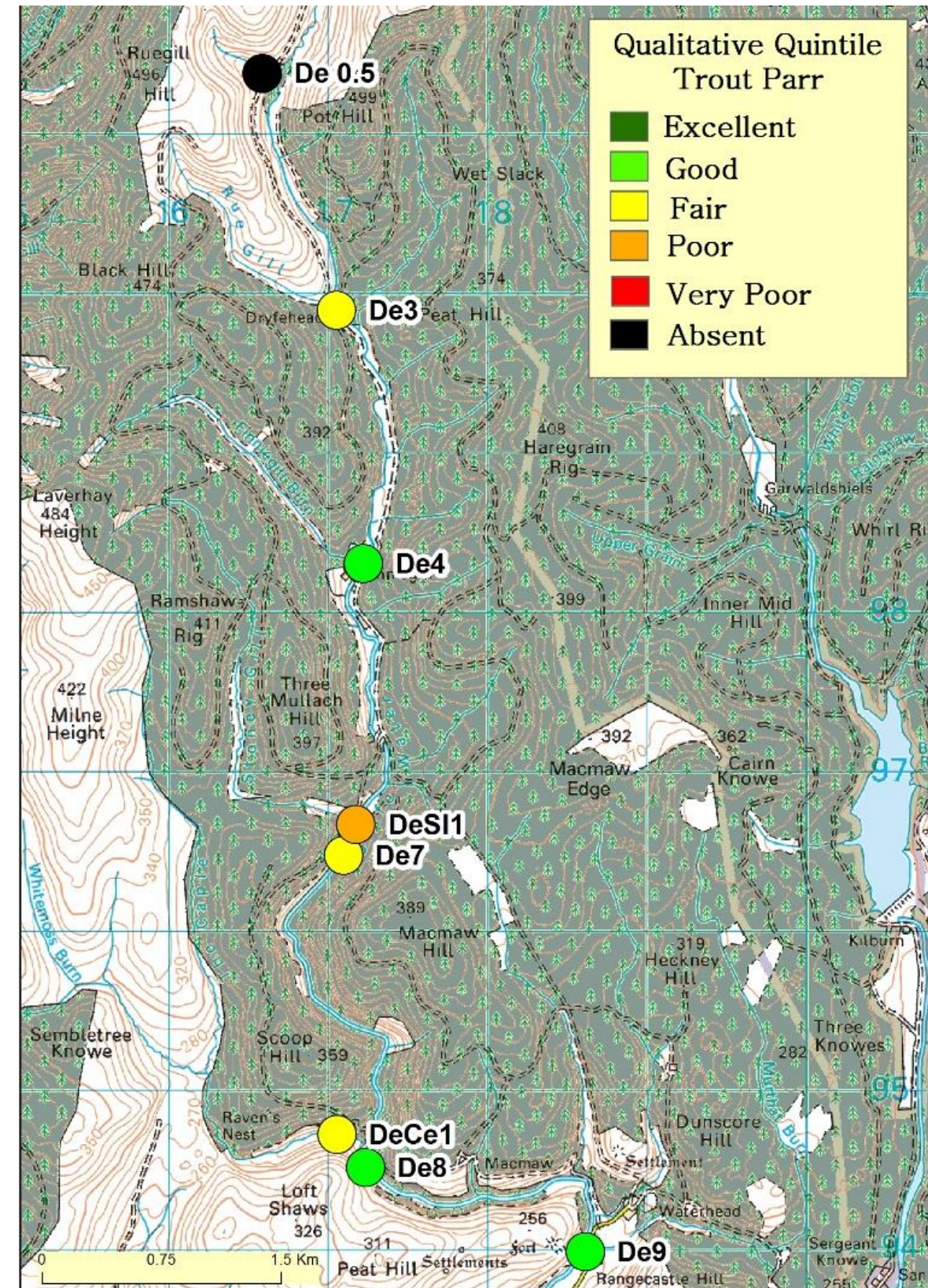




Figure 6 – Habitat Quality At All Sites in 2018

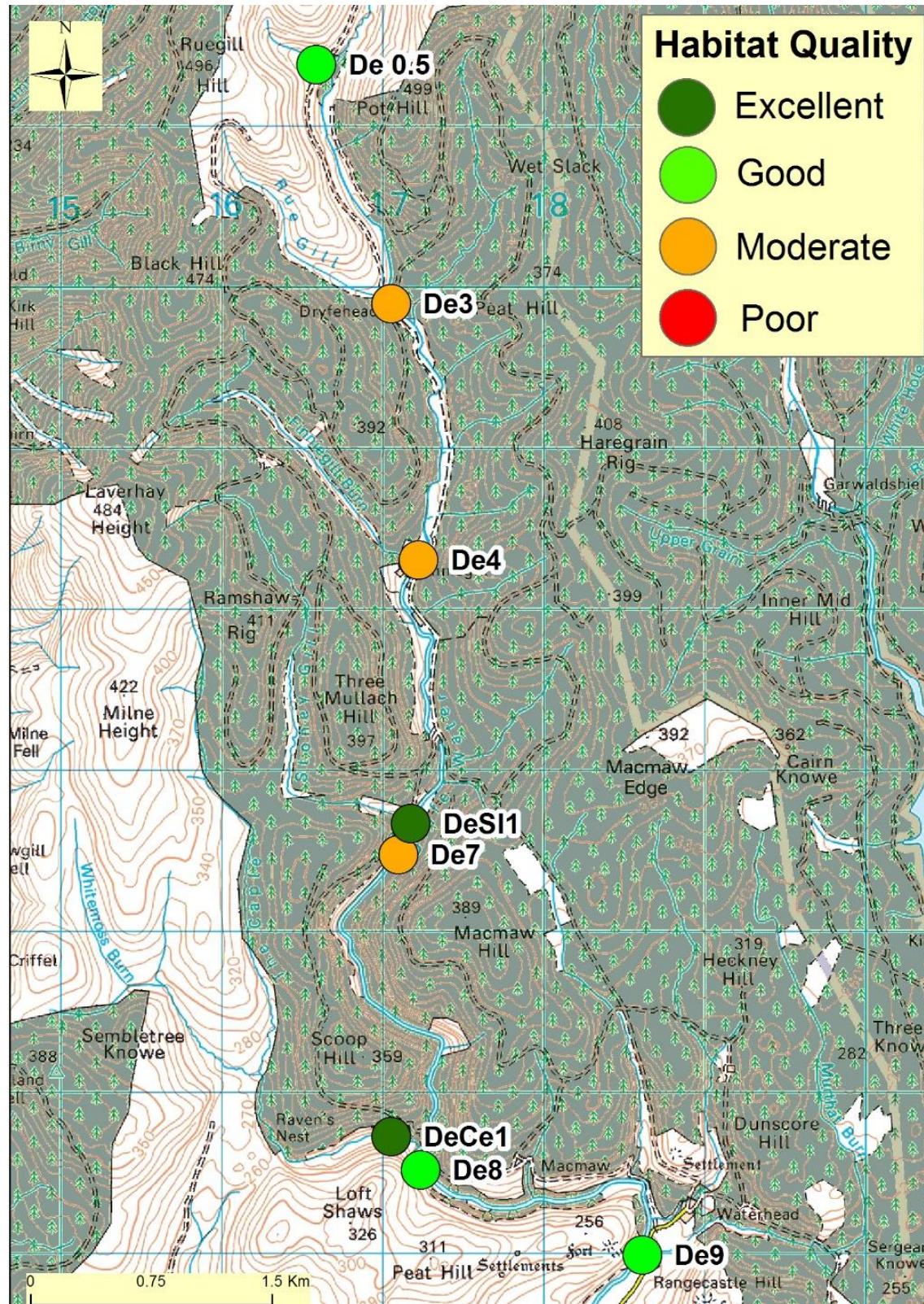
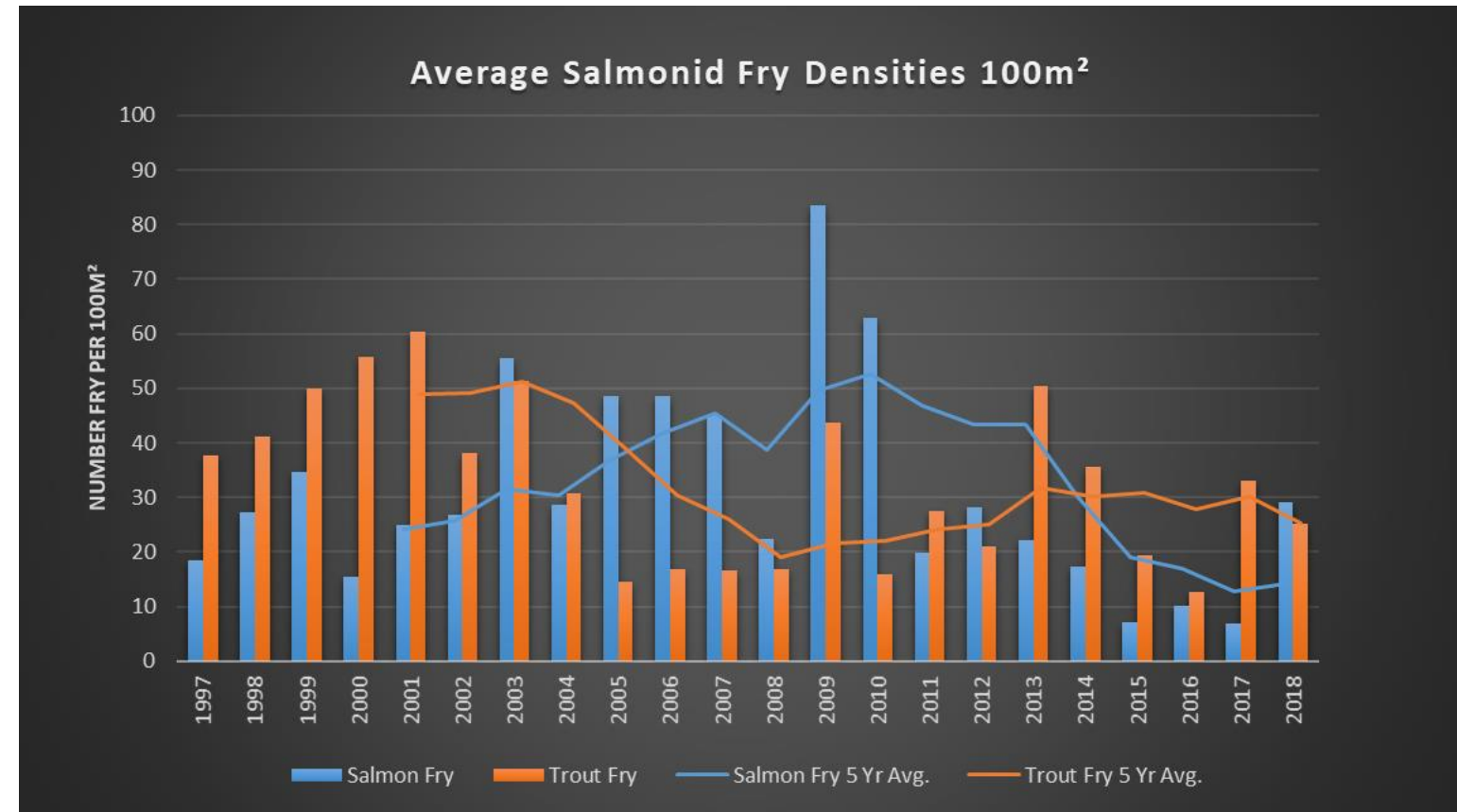


Figure 7 – Average Annual Salmon and Trout Fry Density Data Obtained from 1380 Electrofishing Surveys Conducted Between 1997 - 2018





**5: Appendix**

Easting: 316585	Northing: 601385	Site code: De0.5	Altitude:
River: Dryfe Water			
Site situation: Duncan's Cleugh, upstream of bothy and Irish bridge			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 18.0	Site Length (m): 22.0
Bed Width Area (m <sup>2</sup> ): 18.5	
Bank Width Area (m <sup>2</sup> ): 18.0	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	0.8	0.8	0.9
B	5.5	0.8	0.8	0.7
C	11.0	0.9	0.9	1.0
D	16.5	0.7	0.8	0.8
E-Downst	22.0	0.9	0.9	0.7

Depth

< 10	11-20	21-30	31-40	41-50	> 50
70	15	15	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	30	30	30	10	0	0	100

Flow

Flow Speed (m/s):
-------------------

Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	20	5	20	35	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	30	30
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
30	30	30	30	70	70	0	0	0	0	0	0	0	0	130	130

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	None
Capture Net:	Hand/Dip



Effective Fishing:	Yes
Conductivity:	40

Temperature:	9.00
Time:	13:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
									NaN	NaN			
Total	NaN	NaN	0	0	0	NaN							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	

Easting: 317050	Northing: 599900	Site code: De3	Altitude: 300
River: Dryfe Water			
Site situation: Dryfehead below Irish Bridge			
Access/permission: Left Bank: Til Hill Economic Forestry			Right Bank: Dito
			Date: 23/09/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 74.9	Site Length (m): 18.5
Bed Width Area (m <sup>2</sup> ): 77.2	
Bank Width Area (m <sup>2</sup> ): 80.9	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0		3.7	3.7	3.4
B	6.0		4.2	4.4	4.5
C	12.0		4.1	4.4	4.6
D-Downst	18.5		4.2	4.2	5.0

Depth

< 10	11-20	21-30	31-40	41-50	> 50
85	15	0	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Partly
Notes: Compact due to Irish bridge?	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	35	35	25	5	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	20	70	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	10	90
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	90	10	60	90	10	0	0	0	0	0	0	0	0	100	160

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5

Smooth Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	60

Temperature:	9.00
Time:	12:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

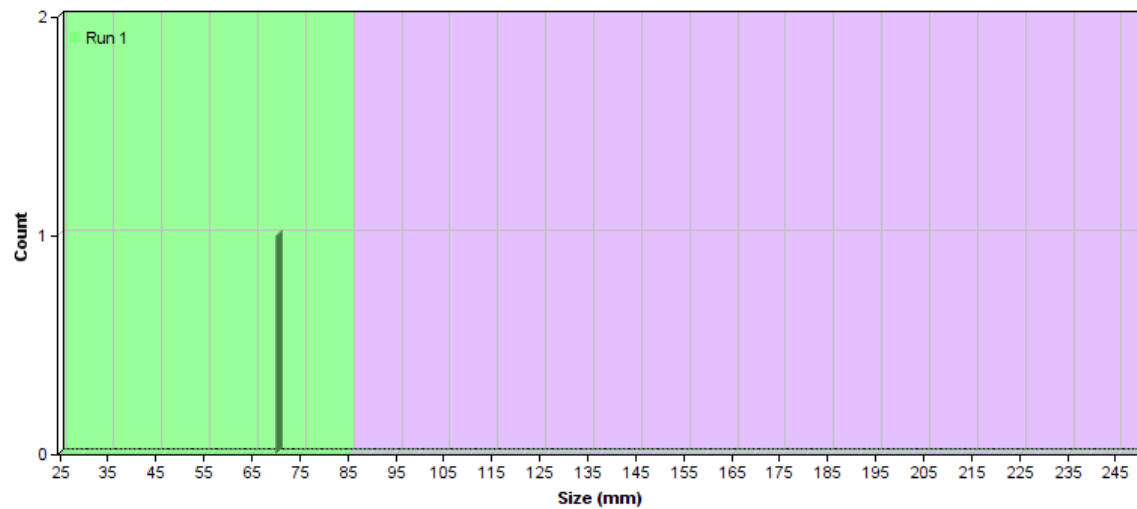
**Atlantic Salmon Density Report**

- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of

Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	0	0	0	0	1			1.335	1.335	70		
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	1	0	0	0	0	1							
Salmon Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

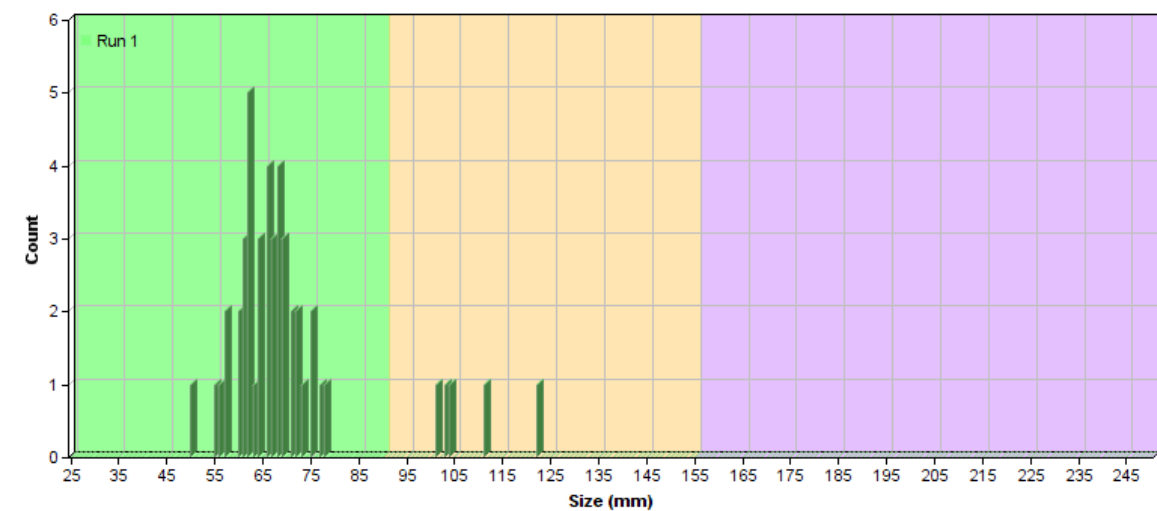


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	42	0	0	0	0	42			56.060	56.060	65	6.090	
1+	5	0	0	0	0	5			6.674	6.674	108	8.585	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	47	0	0	0	0	47							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Eastings: 317221	Northing: 598310	Site code: De4	Altitude: 270
River: Dryfe Water			
Site situation: u/s ford at Finniegill			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 14/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 120.4	Site Length (m): 19.5
Bed Width Area (m <sup>2</sup> ): 149.7	
Bank Width Area (m <sup>2</sup> ): 177.5	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.0		6.5		8.0	
B	6.5		6.1		7.0		8.4	
C	13.0		6.0		8.0		9.5	
D-Downst	19.5		6.6		9.2		10.5	

Depth

< 10	11-20	21-30	31-40	41-50	> 50
40	40	20	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	50	20	10	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	40	40	20	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	0	10
Bankface Veg.	Bare	Uniform
Banktop Veg.	Uniform	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	10	0	10	100	90	0	0	0	0	0	0	0	0	100	110

Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth Pulsed:	/ Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	90



Temperature:	12.50
Time:	10:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

Total	4	0	0	0	0	4							
Salmon Missed						(NaN)							

Other Fish Species Count

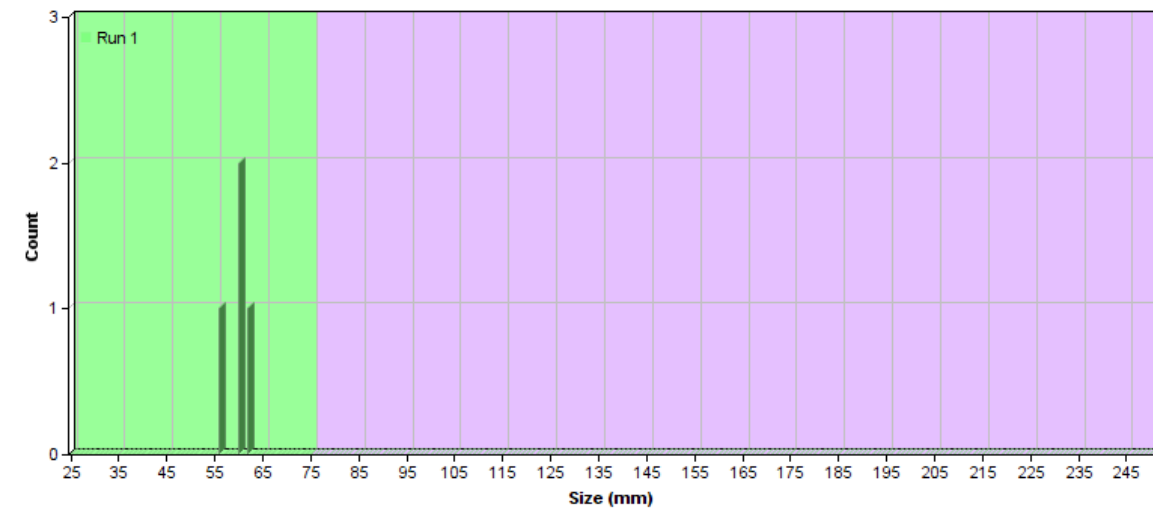
Species	Count

Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	4	0	0	0	0	4			3.322	3.322	59	2.517	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



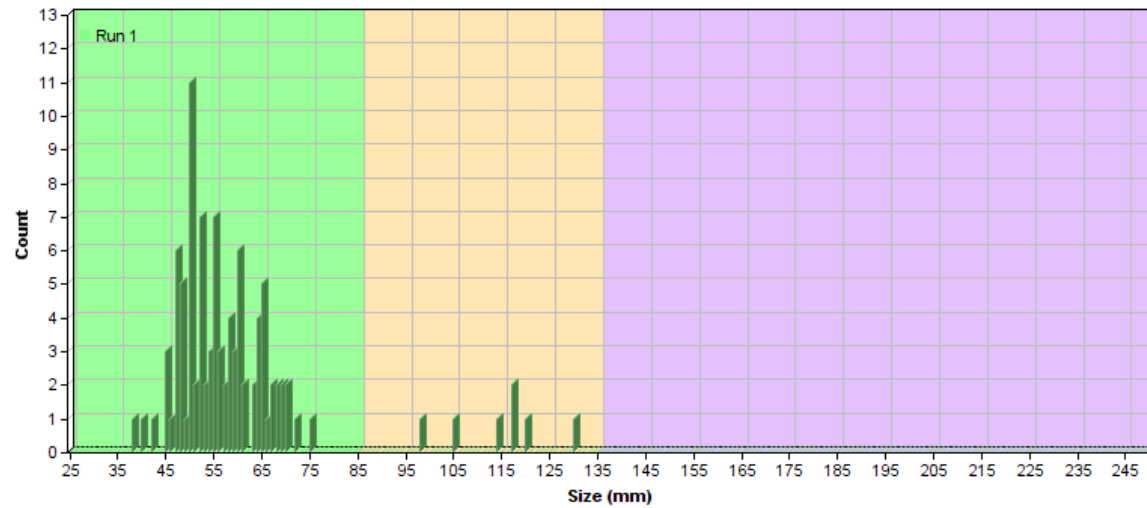
Brown Trout (Sea Trout) Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	93	0	0	0	0	93			77.236	77.236	55	7.808	
1+	7	0	0	0	0	7			5.813	5.813	114	10.374	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			

4++	0	0	0	0	0	0			0.000	0.000			
Total	100	0	0	0	0	100							
Trout Missed		(NaN)											

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Easting: 317172	Northing: 596673	Site code: DeSI1	Altitude:
River: Stoney Gill			
Site situation: Stoney Gill, U/s Dryfe confluence, D/s of oblong culvert			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Excellent	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 32.2	Site Length (m): 20.6
Bed Width Area (m <sup>2</sup> ): 35.5	
Bank Width Area (m <sup>2</sup> ): 32.5	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0		1.4	1.4	1.2
B	7.0		1.2	1.8	1.5
C	14.0		1.5	1.5	1.6
D-Downst	20.6		2.2	2.2	2.0

Depth

< 10	11-20	21-30	31-40	41-50	> 50
20	50	20	10	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	25	40	25	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	10	0	0	20	30	30	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	60	60
Bankface Veg.	Uniform	Uniform

Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
60	60	60	60	40	40	0	0	0	0	0	0	0	0	160	160

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	70

Temperature:	9.00
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes

Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

**Atlantic Salmon Density Report**

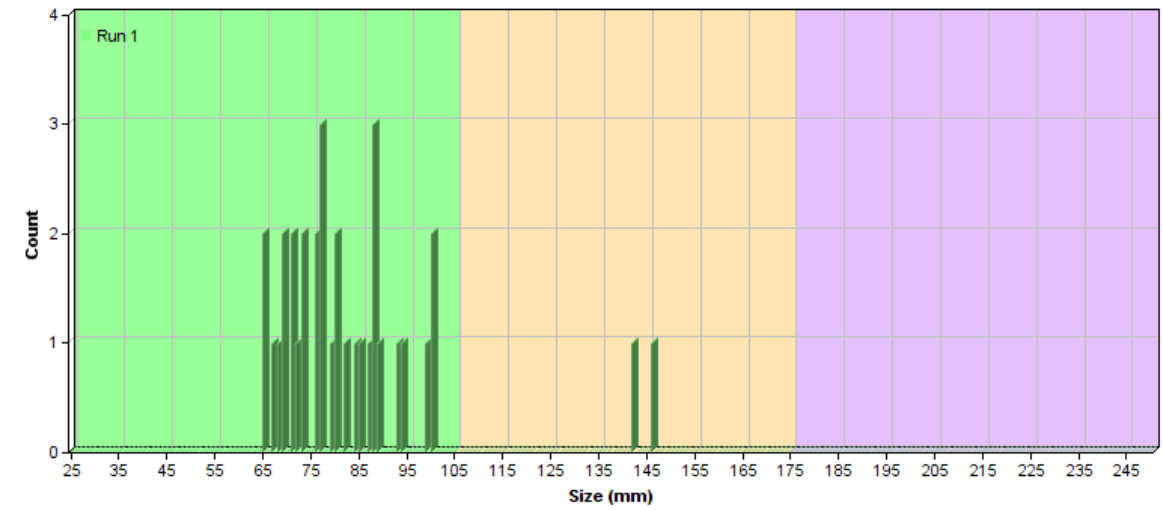
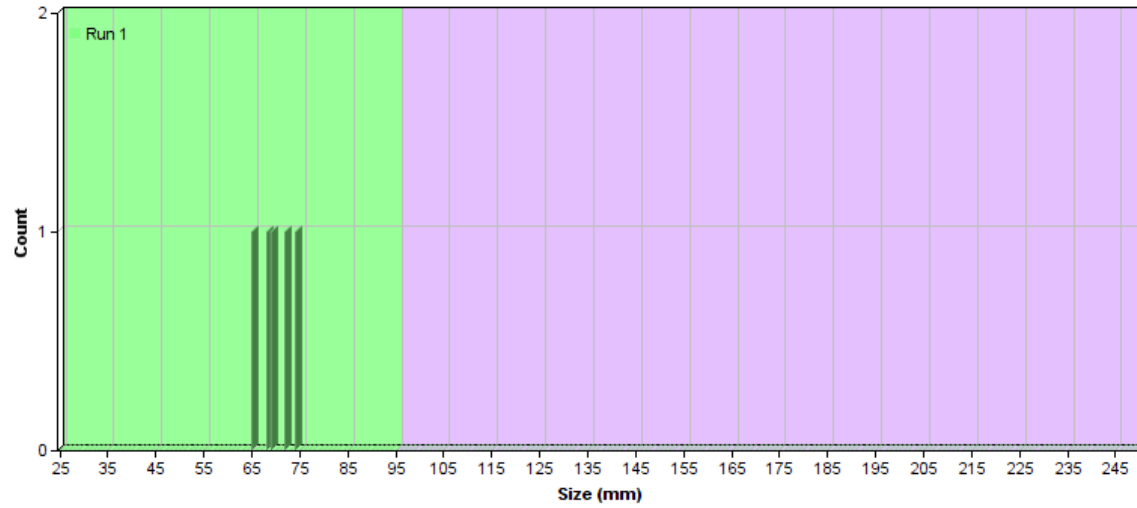
• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	5	0	0	0	0	5			15.533	15.533	69	3.507	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	5	0	0	0	0	5							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					

2+						2+					
3+						3+					
4++						4++					

1+						1+					
2+						2+					
3+						3+					
4++						4++					



**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	32	0	0	0	0	32			99.410	99.410	80	10.289	
1+	2	0	0	0	0	2			6.213	6.213	144	2.828	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	34	0	0	0	0	34							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					



Eastings: 317180	Northing: 596644	Site code: De7	Altitude: 245
River: Dryfe Water			
Site situation: d/s Stoneygill Burn, path down from picnic bench on right bank			
Access/permission:		Date: 14/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 144.5	Site Length (m): 27.4
Bed Width Area (m <sup>2</sup> ): 145.9	
Bank Width Area (m <sup>2</sup> ): 152.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		5.0		5.0		4.9	
B	9.0		5.2		5.4		5.4	
C	18.0		5.5		5.5		5.7	
D-Downst	27.4		5.4		5.4		6.2	

Depth

< 10	11-20	21-30	31-40	41-50	> 50
50	40	10	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	40	40	0	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	50	50	0	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	70	70
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
70	70	70	70	30	30	0	0	0	0	0	0	0	0	170	170

Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

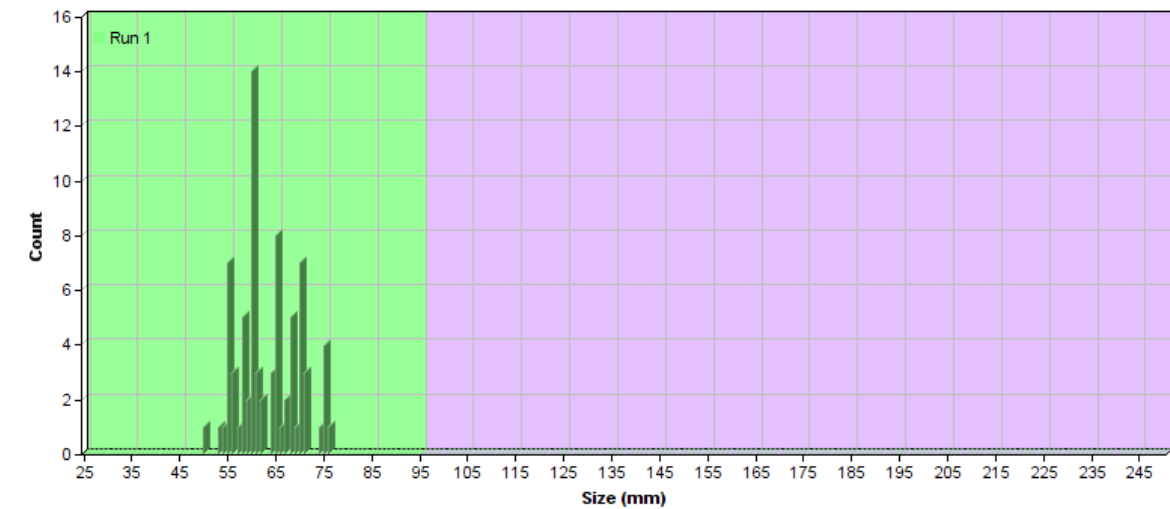
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	76	0	0	0	0	76			52.584	52.584	63	6.234	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

Total	76	0	0	0	0	76							
Salmon Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



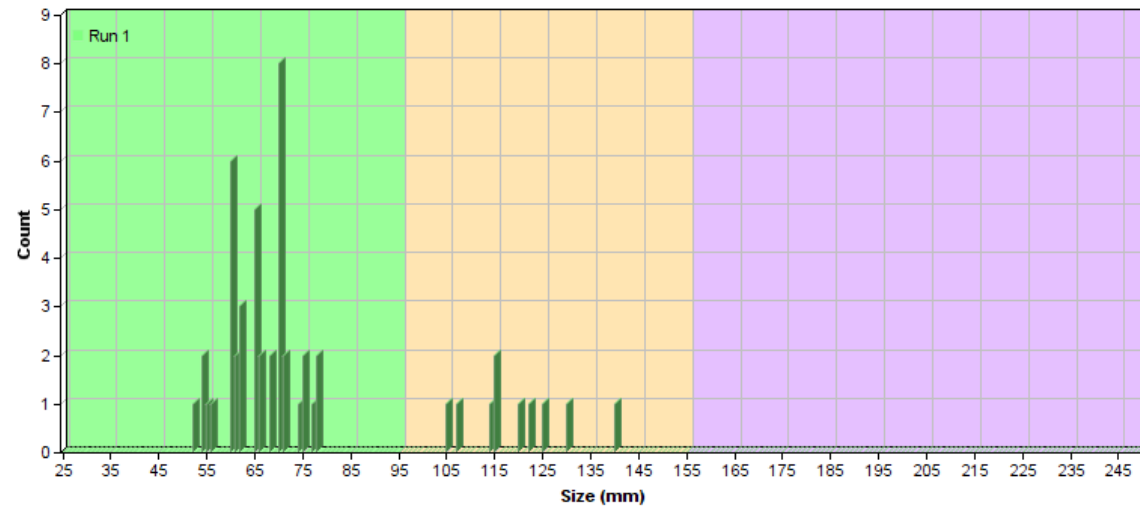
Brown Trout (Sea Trout) Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	41	0	0	0	0	41			28.368	28.368	65	6.781	
1+	10	0	0	0	0	10			6.919	6.919	119	10.563	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			

4++	0	0	0	0	0	0			0.000	0.000			
Total	51	0	0	0	0	51							
Trout Missed						(NaN)							

Zippin						Carle & Strub							
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability		
		Lower	Upper	95%				Lower	Upper	95%			
0+						0+							
1+						1+							
2+						2+							
3+						3+							
4++						4++							



**SFCC Electrofishing Event Report**

Easting: 317175	Northing: 594684	Site code: DeCe1	Altitude:
River: The Caple			
Site situation: u/s of Dryfe confluence			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Excellent	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 74.0	Site Length (m): 20.0
Bed Width Area (m <sup>2</sup> ): 78.5	
Bank Width Area (m <sup>2</sup> ): 121.0	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		4.0		4.0		6.7	
B	7.0		3.0		3.9		6.4	
C	14.0		3.5		3.5		5.6	
D-Downst	20.0		4.3		4.3		5.5	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
30	60	10	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	20	50	20	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	10	0	20	50	20	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Bare	Bare
Banktop Veg.	Bare	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes

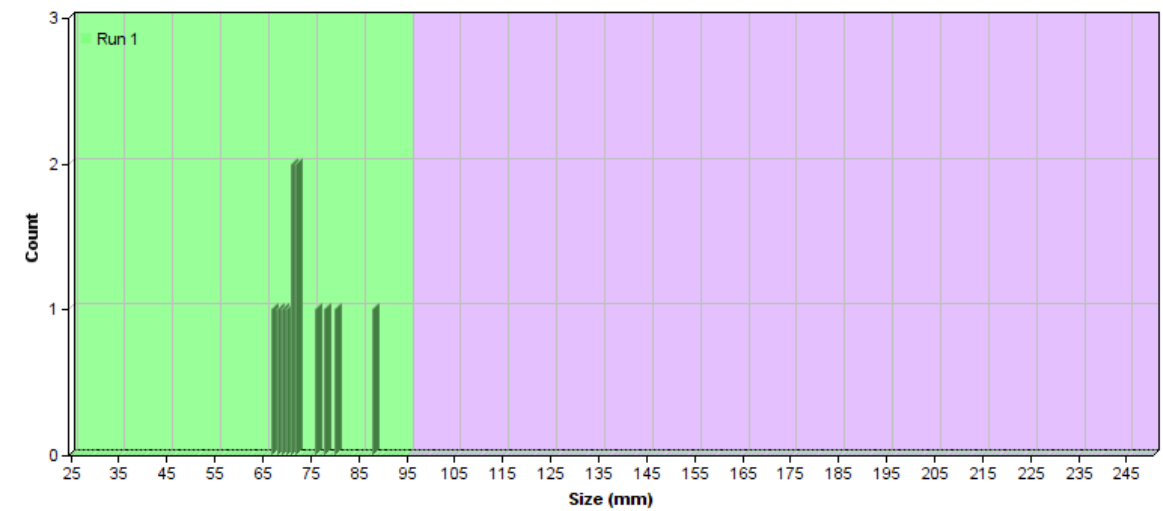


Conductivity:	90
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Temperature:	10.00
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

Total	12	0	0	0	0	12					
Salmon Missed						(NaN)					

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



**Other Fish Species Count**

Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

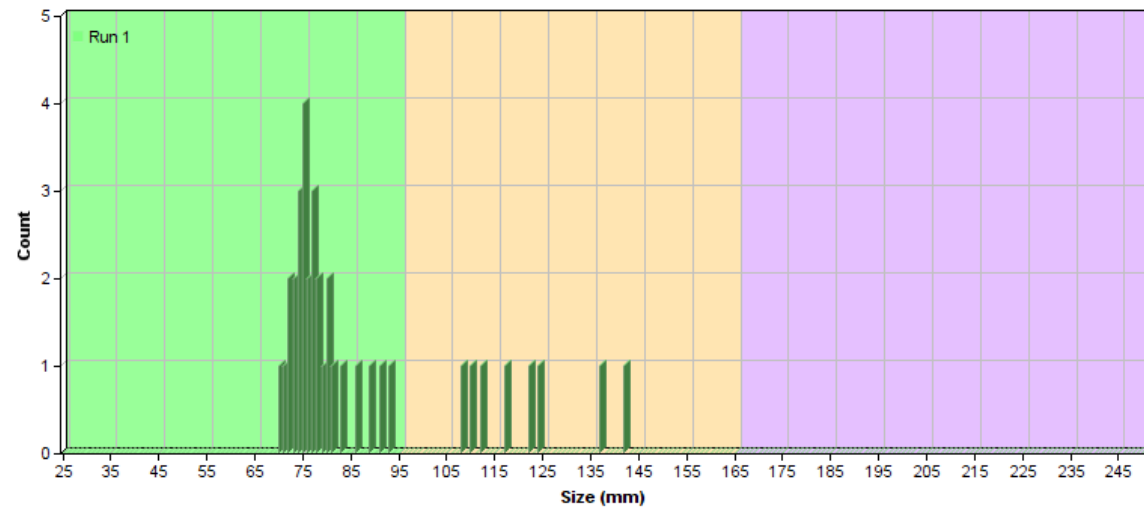
Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	12	0	0	0	0	12			16.216	16.216	73	6.038	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	29	0	0	0	0	29			39.189	39.189	77	5.824	
1+	8	0	0	0	0	8			10.811	10.811	121	12.490	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	37	0	0	0	0	37							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Easting: 317257	Northing: 594658	Site code: De8	Altitude: 200
River: Dryfe Water			
Site situation: riffle u/s culvert			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 14/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 116.4	Site Length (m): 17.5
Bed Width Area (m <sup>2</sup> ): 116.4	
Bank Width Area (m <sup>2</sup> ): 115.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.2		6.2		6.1	
B	6.0		6.2		6.2		6.2	
C	12.0		6.7		6.7		6.5	
D-Downst	17.5		7.5		7.5		7.5	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
20	30	20	20	10	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	30	50	10	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	30	30	30	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	10	10
Bankface Veg.	Complex	Uniform
Banktop Veg.	Complex	Complex
Overhang Bough (%)	90	0
Canopy Cover (%)	20	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	10	10	90	90	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth Pulsed:	/ Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

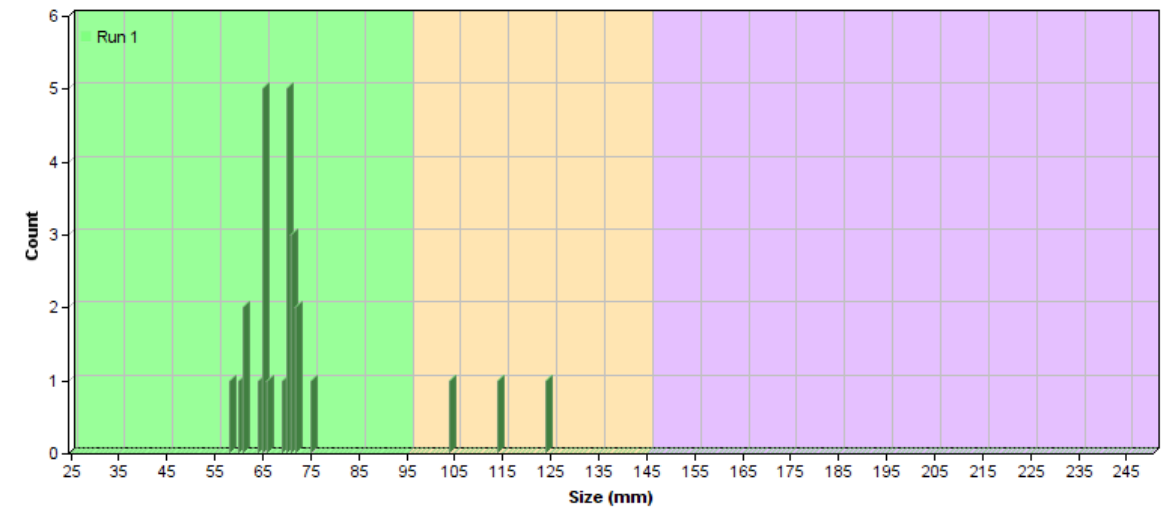
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	23	0	0	0	0	23			19.763	19.763	67	4.482	
1+	3	0	0	0	0	3			2.578	2.578	114	10.000	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	26	0	0	0	0	26							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



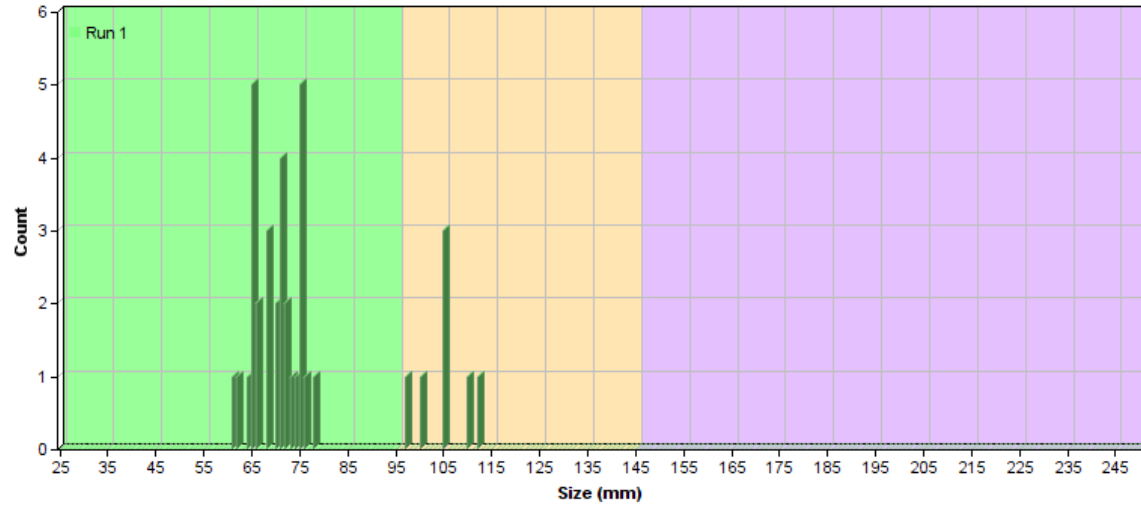
**Brown Trout (Sea Trout) Density Report**

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Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	30	0	0	0	0	30			25.778	25.778	69	4.586	
1+	7	0	0	0	0	7			6.015	6.015	104	5.210	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	37	0	0	0	0	37							
Trout Missed						(NaN)							



Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+											
1+											
2+											
3+											
4++											



Easting: 318610	Northing: 593994	Site code: De9	Altitude: 180
River: Dryfe Water			
Site situation: Below Waterhead and track to Macnaw, upstream of Murthat Burn			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 29/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 134.1	Site Length (m): 19.5
Bed Width Area (m <sup>2</sup> ): 134.1	
Bank Width Area (m <sup>2</sup> ): 154.5	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		8.0		8.0		10.0	
B	6.5		7.2		7.2		8.2	
C	13.0		6.0		6.0		6.5	
D-Downst	19.5		6.3		6.3		7.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	20	30	20	10	10

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	15	25	40	10	10	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	20	30	30	20	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	10	0
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	10	0	90	100	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth Pulsed:	Smooth /
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	180

Temperature:	11.50
Time:	11:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

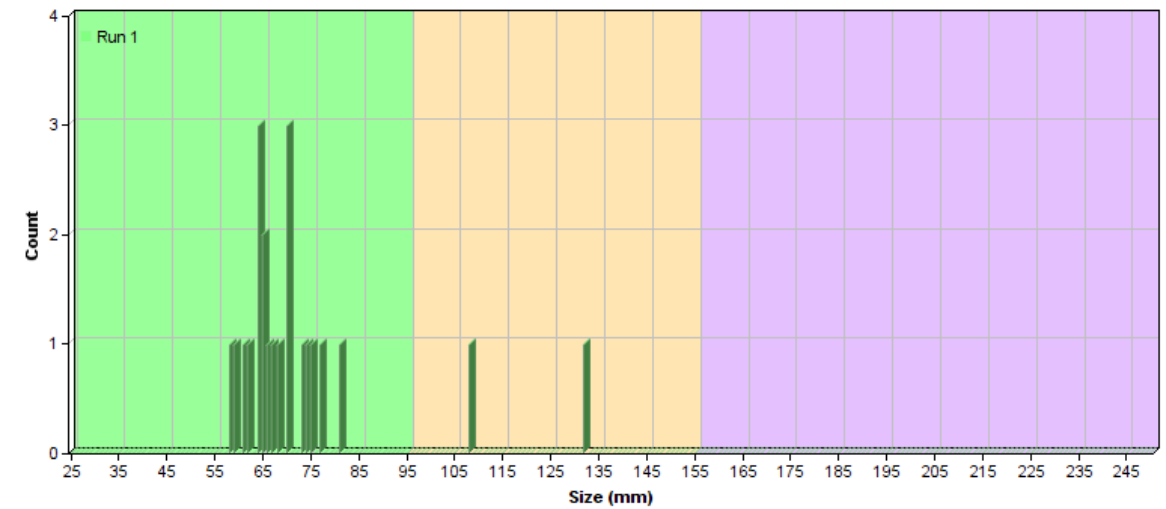
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	20	0	0	0	0	20			14.919	14.919	67	6.098	
1+	2	0	0	0	0	2			1.492	1.492	120	16.971	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	22	0	0	0	0	22							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

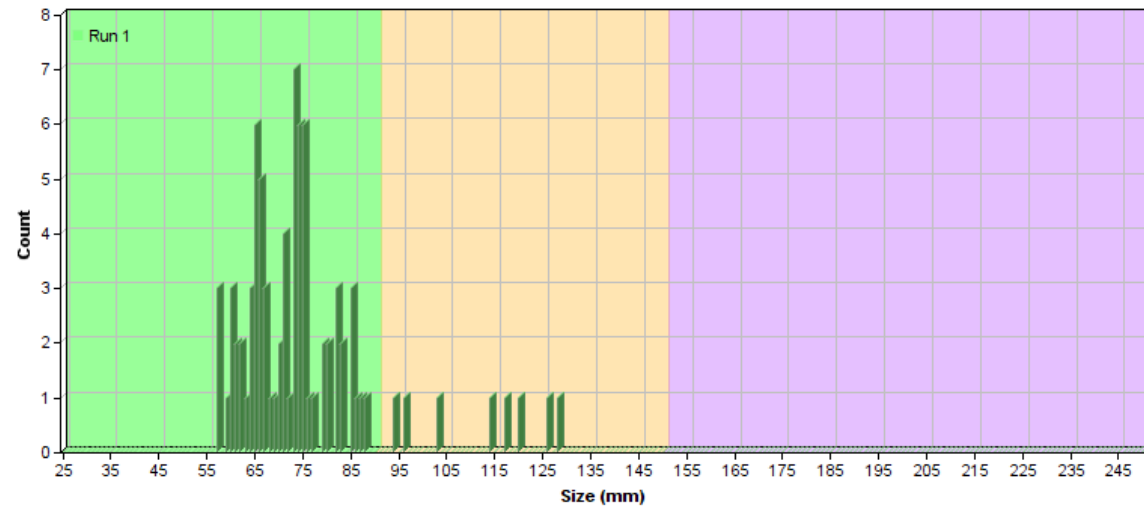


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	74	0	0	0	0	74			55.199	55.199	71	7.945	
1+	8	0	0	0	0	8			5.967	5.967	112	13.123	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	82	0	0	0	0	82							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+											
1+											
2+											
3+											
4++											



## Appendix 8.24b Wamphray Water: Electrofishing Survey

Written by River Annan District Salmon Fishery Board  
February 2019  
Author: T. Donnelly, A. Gillan & C. Stones

### 1: Introduction

- 1.1 The Wamphray Water rises an altitude of 480m above sea-level from the north-western slopes of West Knowe (NT315925 605728). The watercourse flows south westwards for 13km, passing through a series of natural waterfalls in Wamphray Glen (NY312746 596452), then underneath the West Coast Main Line (NY311264 595743) before joining the main River Annan (NY310881 595065). Wamphray Water is the smallest of the eight main tributaries that form the mainstem of the River Annan and historically had an impassable culvert structure in its lower reaches. This structure served as a culvert the river channel underneath the railway line. A new culvert and fish pass were constructed in late 2015 by AMCO Engineering on behalf of Network Rail.
- 1.2 The River Annan District Salmon Fishery Board has collected extensive habitat and fish population data across the Wamphray Water catchment since 1997. Our database comprises of instream and riparian habitat assessments conducted by walkover habitat surveys along 13.3km of mainstem Wamphray Water and a further 4km of two key tributaries. In addition, a total of 53 electrofishing surveys with site specific habitat assessments have been undertaken between 1997 and 2018.
- 1.3 For the purpose of this report a total of ten electrofishing sites were surveyed within suitable areas of fish habitat throughout the proposed wind farm site. The Wamphray Water flows on the western side of the Scoop Hill wind farm site (NY316800 595300). The objective of the surveys is to give an indication of the importance of the Wamphray Water in the vicinity of Scoop Hill for fish ecology and provide a baseline to assess any future changes in habitat or fish populations.
- 1.4 The aims of the study were as follows:
- Undertake electrofishing surveys at ten sites on the Wamphray Water;
  - Analyse data obtained during the electrofishing surveys, presenting the results;
  - Survey and assess river habitat assessment information from each electrofishing site; and
  - Briefly comment on the above results and their suitability for detecting potential threats to fish populations and river ecology in general.

### 2: Methodology

#### Data Recording

- 2.1 The River Annan District Salmon Fishery Board (RADSFB) is a partner in the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Scottish Executive Freshwater Fisheries Laboratory, The Tweed Foundation, the Spey Research Trust, the Tay Foundation and the River Conon District Salmon Fishery Board. This group has, in partnership, developed a set of agreed methodologies and record sheets for use with electrofishing surveys and an associated database in which to record information gathered from such surveys. The electrofishing surveys undertaken have been completed to the standards that are required by the partners of the SFCC and recorded using the formats agreed by this group.

#### Electrofishing Equipment

- 2.2 Backpack apparatus was employed during all electrofishing surveys. This equipment is powered by a double 12v lead-acid battery with a variable voltage output (generally 200 – 250 volts for the purposes of electrofishing surveys). A smooth direct current was used at all sites. The backpack is linked to a cathode of braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.

#### Electrofishing techniques

- 2.3 Electrofishing was undertaken by a team of three SFCC accredited RADSFB staff at all survey sites using semi-quantitative single pass methodology. Electrofishing involves the surveyors passing a current through the water, which temporarily affects the fish's behaviour. When subjected to the current they exhibit a reaction known as forced swimming and swim towards the anode and are captured. The method of fishing involves the anode operator drawing stunned fish downstream to a banner net held against the current by an assistant. Normally direct current is used as this enables the use of high currents without causing untoward damage to the fish. Once captured, the fish recover in a holding container. They are then anaesthetised using a recognised fish anaesthetic (MS222), identified, measured (selected species) and recorded, and once recovered, returned unharmed to the area from which they were captured. The team works its way across and upstream the chosen area, systematically surveying all the watercourse within the selected section.

#### Age Determination

- 2.4 All juvenile salmonids are measured to the nearest millimetre. Length/frequency graphs can then illustrate year classes within the population. Age determination of individual fish can then be made by assessment of their length in relation to the entire population and the length frequency graphs. For discussion purposes, 0+ fry is the young of the fish that have hatched during spring of that survey year. Following their first winter fry develop into the parr stage and may remain in tributaries for additional 3 years, possibly longer as some fish may adapt a non-migratory life history. Parr populations will be considered collectively as 1++ for the remainder of this report. Electrofishing data sheet appendices contain the detailed length frequency graphs that quantify fish density relative to individual year class.

#### Habitat Assessment

- 2.5 At each site, an assessment was made of the instream habitat available for 1++ parr stage salmonids. This assessment graded instream cover present as none, poor, moderate, good or excellent. This grading provides an index of instream cover where diverse substrate compositions will score more favourably than areas of uniform smaller substrate providing poor cover. In accordance with SFCC protocols % estimates of depths, substrate type and flow type were made at each site. Additionally, % estimates of the quantity of the bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation were made. Site habitat assessments and descriptions can be found in section 3.2.

#### Survey Measurement

- 2.6 At each site surveyed a total length was recorded and average wet and dry widths calculated. The average wet width was calculated from four - five individual widths recorded at equidistant intervals from the top of the site (0m) to the bottom. The length of each site from top to bottom was also noted. From these site lengths and average wet widths, the total area fished was calculated.



### 3: Results

#### Fish Densities & Distribution

- 3.1 Table 1 shows a minimum estimate of fish per 100m<sup>2</sup> (based on actual number of fish captured. At sites where parr (1++ fish) could be categorised into more detailed age classes this is shown in the full site reports in the appendix. For the purposes of this report estimates of these different age classes of parr were added together to give an overall 1++ estimate.

#### Quintile Ranges

- 3.2 Densities of fish were calculated separately for 0+ fry (fish that have hatched in the year of survey) and 1++ parr (juveniles that have spent at least one winter in freshwater but have not yet been to sea) for salmon and trout. Estimates of minimum density are calculated by dividing the number of fish captured by the area of stream surveyed. To provide a guide to the relative abundance of salmonid fish sampled during the survey, minimum density estimates are classified according to the SFCC classification scheme (Godfrey, 2005) (Table 3 & 4).
- 3.3 This classification system compares minimum fish abundance sampled at 291 sites in the Solway coast region of Scotland and places abundance into six quintile ranges according to stream width at the survey site. Classes A through to E are given for abundance within each quintile range and class F represents the complete absence of fish. The 100th percentile represents the highest density found at any one of the 291 sites compared. Ultimately this system allows us to compare individual site performance against average regional targets to establish the status of fish populations.
- 3.4 The maps in figures 2, 3, 4 & 5 illustrate the quintile ranges for each site.

#### Site Habitat Assessments

- 3.5 Full descriptions of the types of habitats found on the survey reaches are available in the appendix

#### Habitat Descriptions

- 3.6 Table 4 is a summary of the habitat characteristics found at all sites during the 2018 surveys. The full habitat data set is included in the SFCC electrofishing report in the appendix.



**Wy0.5 (Easting: 314912 Northing: 601326)**

At an altitude of 225m, Wy 0.5 is the uppermost site surveyed in this report. Substrates are dominated by pebble/cobble and instream cover is assessed as good. There is some bankside cover (60% right bank) in the form of undercut with draped vegetation features providing additional cover for 1++ parr stages. Although bordered by commercial forestry, riparian cover is lacking with limited overhanging boughs/shading from the left bank. Although bankside and riparian habitat is limited the instream substrates provide suitable cover for fry and parr stages

**Wy7 (Easting: 313400 Northing: 596880)**

Wy7 is located 380 metres downstream of Wy6 at an altitude of 152m. Substrates are dominated by pebbles and cobble at this site and instream cover is assessed as good. There is no bankside cover on either the right or left bank. Riparian cover is limited (10% on the right bank and 10% on the left bank) providing a small amount of cover and shading. Despite the good instream cover no salmon were recorded at Wy7 despite being found upstream

**Wy1 (Easting: 313875 Northing: 599125)**

Site Wy 1 is located at an altitude of 170m, with the large boulder pictured marking the downstream extent of the site. Habitat is generally good at this site with pebble/cobble dominated substrates providing good instream cover. Abundant riparian tree cover on the right bank (60%) provides plenty of shade, however the left bank is considerably less vegetated with only 10% riparian cover. Bankside cover is moderate on the right bank (30%) but limited on the left bank (10%). Several large boulders create additional habitat for 1++ parr stages. Directly upstream of the site is a densely wooded section of river which provides excellent cover and shading for fish.

**Wy2 (Easting:312939 Northing:596526)**

Wy2 is located at an altitude of 131m and is situated just upstream of a high gradient, bedrock section that contains a natural waterfall. The waterfall does pose a challenge to migratory salmonids but has been assessed as passable in certain flow conditions. Substrates are dominated by gravel, pebbles and cobble at this site and instream cover is assessed as poor. Although the pebble/cobble substrates lend themselves to salmon spawning, these are situated on top of a layer of bedrock. As a result, the substrate may be of insufficient depth for spawning and subject to wash out during high flows. Neither bank provide any bankside cover. Salmon parr were found at the site in 2016 & 17 are likely to be survivors from the 2015 introduction of salmon fry, relocated from below the culvert.

**Wy6 (Easting: 313610 Northing: 597190)**

Wy6 is located at an altitude of 152m. Substrates are dominated by pebble and small cobble at this site and instream cover is assessed as good. There is no bankside cover on either the right or left bank. Riparian cover is also lacking with none recorded on either bank.

**Wy8 (Easting: 311900 Northing: 596200)**

Wy 8 is located at an altitude of 117m and is situated approximately 1.7km upstream of the newly installed fish pass. Instream habitat at the site is classed as good and substrates are predominantly comprised of pebble and cobble. Bankside cover is absent on both banks. Riparian cover is lacking with no overhanging boughs/shading from the right bank and only 10% cover on the left bank.





**Wy3 (Easting: 311900 Northing: 596200)**

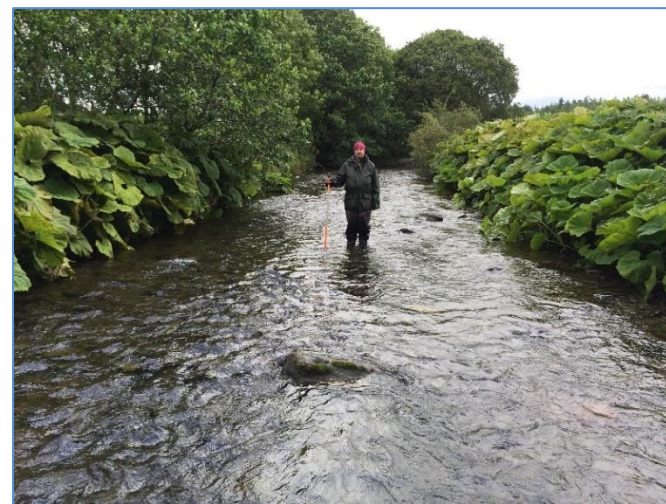
Wy 3 is located at an altitude of 89 m and is situated approximately 800m upstream of the newly installed fish pass. The river channel has been straightened significantly through this section. Instream habitat at the site is classed as good and substrates are comprised predominately of pebble and cobble. Bankside cover is absent on the left bank and limited on the right bank (5%). Riparian cover is lacking with no overhanging boughs/shading from the left bank and only 5% cover on the left bank.

**Wy4 (Easting: 311169 Northing:595618)**

Wy 4 is located at an altitude of 75m and is situated in a straightened section of the Wamphray Water, downstream of the newly installed fish pass. Instream cover is described as good at this site and is predominately cobble. No riparian cover is present within the survey site. The left bank provides no bankside cover while the riprap installed to reinforce the right bank provides 100% cover creating good instream habitat for salmonid parr and other species such as European eel.

**Wy5 (Easting:310959 Northing:595359)**

Wy5 is the furthest downstream of the sites included in this report and is situated at an altitude of 73m. Again, the river has been straightened significantly through this section. Instream habitat at the site is classed as good and substrates are comprised of predominately pebble and cobble. Bankside cover is absent on the left bank however draped vegetation provides 70% cover on the right bank. Riparian cover is lacking with no overhanging boughs/shading on the left or right bank.



## 4: Discussion

### 4.1 Habitat and Fish Populations

The Wamphray Water is a high gradient watercourse with natural morphological features along the vast majority of its channel. The instream habitats of the Wamphray Water are dominated by large pebble/cobble substrate and this high gradient tributary provides significant habitat for both salmon and trout throughout its entire reach, both upstream and downstream of the natural waterfalls in Wamphray Glen.

Due to the steep nature of Wamphray catchment there is limited fish habitat available in the tributaries running down the steep hillsides and many of the watercourses are ephemeral habitat. The river channel has been significantly straightened in its lower reaches which has resulted in the substrates becoming partly compacted and potentially limiting the suitability of habitat for 1++ parr. This straightened section is flanked by low productivity improved grassland on both banks.

The land use within the Scoop Hill wind farm area is exclusively commercial forestry. There is some light/moderate grazing from sheep and cattle in the Laverhay section on the southern edge of the proposed site. There are no significant land use practices limiting fish populations in this part of the system. However, walkover surveys indicate around 70% of the banksides would benefit from the creation of riparian buffer zones to increase bankside cover and shading for fish.

We do not consider historical forestry practices to have had any detrimental impact on habitat or water quality on the river environment in proximity to Scoop Hill. Significant felling operations are due to commence in 2019 and tracks have been upgraded in 2018. All planting and felling operations are currently within Forestry & Water guidelines.

Between 1996 and 2016, over 12km of the Wamphray Water was inaccessible to migratory fish due to a culvert under the West Coast Main Line. In 2011 the culvert was assessed by the River Annan District Salmon Fishery Board as a complete barrier to upstream fish migration for all species due to the effective swim length, high velocity and shallow depth of water on the structure. In the highly unlikely event of fish negotiating this part of the structure the jump barrier at the end of the culvert was also impassable due to the lack of jump pool, height and gradient. This assessment was consistent with historical electrofishing data which only juvenile brown trout (*Salmo trutta*) above the structure. Population dynamics of trout above the culvert were typical of a resident/isolated population with low fry density at ratios equal to parr.

Sites Wy0.5, Wy1, Wy2, Wy6 & Wy7 are located upstream of the natural waterfalls and cascades in Wamphray Glen. Figures 2 & 4 illustrate the stark contrast of salmon and trout fry densities encountered upstream and downstream of Wamphray Glen. Surveys in 2017 also failed to identify signs that adult salmonids had successfully ascended the falls. The obstacles within Wamphray Glen have been assessed as passible at certain flow conditions and there was historical information that salmon and sea trout can make it through this high gradient section. Salmon and trout have been observed attempting to ascend the falls in autumn 2017 & 2018 and the Fishery Board recommends that surveys should continue until 2021 before conclusions can be made about passability.

Sites Wy3, Wy8 & Wy9 are situated upstream of the West Coast Main Line and downstream of Wamphray Glen. Sites Wy3 and Wy8 provide a good mixture of salmon dominated fry and parr habitat while site Wy9 is an optimal spawning area for both salmon and trout. All three sites are in the vicinity of the full spectrum of suitable habitat for fry and parr stages of both species. Instream habitat within reach of stream in this section is of very high quality. 2018 salmon and trout fry densities are classed as excellent at all three sites which bodes well for the rapid recolonization of newly accessible habitat. Parr densities were disappointing for both species but poor adult recruitment in tributaries 2017 coupled with the drought conditions in 2018 are likely to be the cause.

Relative to other parts of the Annan catchment, juvenile salmonid numbers (Fig 7) have remained consistent at the historically accessible sites downstream of the railway line. Sites Wy4 & Wy5 have regularly record some of the highest salmon fry densities in the catchment between 1997 and 2015 sometimes exceeding 300 fry per 100m<sup>2</sup>. This is an artefact of fish having limited access to the lower reaches of the Wamphray and multiple fish using the same spawning substrates. Since the installation of the fish pass salmon fry densities have remained excellent and trout fry numbers are within expected ranges given that adult salmon will dominate spawning territory and overcut trout redds, thus displacing eggs. Given the high densities of salmon fry and trout which are routinely encountered at Wy4 & Wy5, subsequent parr densities are disappointing. This can be attributed to the partly compacted nature of the substrates and the proximity to the main River Annan that provides more optimal parr habitat just a few hundred meters downstream.

Stone loach (*Barbatula barbatula*) have been identified at sites Wy4 and Wy5 downstream of the railway line in most survey years. This species is widely distributed in low gradient sites around the catchment and its presence on the lower reaches on the Wamphray should be expected. Despite the presence of a large impassable structure at the bottom of the river a limited number of European eels (*Anguilla anguilla*) can bypass the structure by moving over land to ascend into the main river. The bankside cover along the right bank at site Wy4 created by the placement of large boulders which act as bank protection creates optimal habitat for eels. Many of the eels recorded across the catchment are associated with physical structures such as bridges, walls and grey bank protection that provides eels with deep. There is a statutory requirement for the barrier at the foot of the Annan to be removed or eased by 2026 and habitat on the Wamphray is likely to be recolonised following this remedial action.

#### 4.2 Special Conservation Status

- The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.
- Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List.
- There is some protection for brown trout in terms of exploitation controls within fisheries legislation and sea trout are further protected within fisheries acts relating to the protection of 'salmon', which includes the statutory protection provided by District Salmon Fisheries Boards. In 2007 both ancestral brown trout and sea trout were added to the UKBAP Priority Species List.

#### 4.3 Summary

Following analysis of the data collected in 2018 and supported by comprehensive historical datasets, the fish ecology and habitat features of the Wamphray Water within proximity to Scoop Hill wind farm can be summarised as follows;

Our surveys identified a good mixture of salmon and trout habitats for both fry and parr stages of the two species. Habitat can be considered optimal for salmon and migratory trout throughout all the Wamphray Water except within the high gradient bedrock section which forms Wamphray Glen. The Wamphray Water has the potential to function as a significant nursery for juvenile salmonids. Given the quality of the instream habitat we predict that good to excellent quintile ranges would be consistently found at sites accessed by returning adult salmon and trout in future. Natural population dynamics are still establishing following the installation of a highly effective fish pass in 2016 and ongoing monitoring will be required to quantify the carrying capacity for the different life stages of both species.

Electrofishing results from Wy4 and Wy5 clearly indicates that Wamphray has excellent potential for spawning/fry stages and that parr may descend into the deeper pools/runs on the main river just a few hundred meters downstream. Early indications at sites Wy3, Wy8 and Wy9 are that migratory salmon and trout are utilising this newly available habitat and depositing adequate numbers of ova to populate habitat to carrying capacity. The ability of sites Wy3, Wy8 & Wy9 to support parr stages can be quantified from 2020 onwards once competition between multiple year classes has been established. There is still uncertainty about the ability of adult salmonids to ascend the natural waterfalls in Wamphray Glen and access sites Wy0.5, Wy1, Wy2, Wy6 & Wy7. It may be 2021 before any conclusions can be made about the success of fish to pioneer into the abundance of high-quality habitat in the vicinity of Laverhay and further upstream in the Scoop Hill wind farm area.



**Table 1: Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Wy0.5	0.0	0.0	9.6	7.9
Wy1	0.0	0.0	3.8	1.0
Wy2	0.0	0.0	1.9	4.0
Wy3	102.6	3.6	30.3	7.0
Wy4	243.5	7.0	49.7	0.0
Wy5	133.8	1.0	12.4	0.0
Wy6	0.0	0.0	3.0	3.0
Wy7	0.0	0.0	1.2	3.0
Wy8	205.0	5.9	35.3	1.0
Wy9	337.4	1.5	82.1	0.0

**Table 2: Quintile Explanation**

Density Figure Quintile Range	Classification
> 80th percentile to max	Excellent
> 60th percentile to < 80th percentile	Good
> 40th percentile to < 60th percentile	Fair
> 20th percentile to < 40th percentile	Poor
> present to < 20th percentile	Very Poor
Zero	Absent

**Table 3: Fish Density Classification for the Solway Region**

Salmon 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.2	1.0	1.7	0.7
20 <sup>th</sup> Percentile	3.0	6.1	11.7	7.1
40 <sup>th</sup> Percentile	8.4	16.4	19.3	11.7
60 <sup>th</sup> Percentile	19.7	33.9	32.8	22.0
80 <sup>th</sup> Percentile	37.3	54.9	48.4	38.9
100 <sup>th</sup> Percentile	221.4	167.3	125.2	120.3
Salmon 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.8	0.4	0.8	0.5
20 <sup>th</sup> Percentile	2.5	2.9	3.9	2.8
40 <sup>th</sup> Percentile	5.1	5.7	8.2	6.0
60 <sup>th</sup> Percentile	7.8	10.4	11.4	8.8
80 <sup>th</sup> Percentile	11.1	15.3	17.3	13.6
100 <sup>th</sup> Percentile	36.2	33.8	30.6	50.4
Trout 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	0.5	0.8	0.4
20 <sup>th</sup> Percentile	5.6	6.4	4.0	1.4
40 <sup>th</sup> Percentile	19.9	18.4	7.4	3.4
60 <sup>th</sup> Percentile	48.4	32.4	21.8	9.7
80 <sup>th</sup> Percentile	94.6	51.3	32.6	24.0
100 <sup>th</sup> Percentile	415.7	221.4	160.8	100.5
Trout 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	1.2	0.5	0.3
20 <sup>th</sup> Percentile	4.0	3.2	1.7	0.7
40 <sup>th</sup> Percentile	8.4	5.8	3.5	1.1
60 <sup>th</sup> Percentile	11.6	8.1	5.6	2.1
80 <sup>th</sup> Percentile	23.1	15.3	10.0	4.5
100 <sup>th</sup> Percentile	174.2	67.4	204.4	8.8

**Table 4: Habitat Characteristics For All Sites Surveyed in 2018**

	Site Code	Average Wet Width (m)	Altitude (m)	Instream Parr Cover	Dominant Substrate	Bankside Cover (%)		Riparian cover (%)	
						Left bank	Right bank	Left bank	Right bank
<b>Upstream of culvert &amp; fish pass</b>	Wy0.5	3.82	225	Good	Pebble/Cobble	0	0	10	0
	Wy1	4.73	170	Good	Pebble/Cobble	0	15	0	95
	Wy6	5.25	152	Good	Pebble/Cobble	0	10	0	10
	Wy7	5.63	152	Moderate	Pebble/Cobble	0	0	100	100
	Wy2	5.25	131	Poor	Bedrock	0	20	0	100
	Wy8	6.18	117	Good	Pebble/Cobble	0	0	100	0
	Wy9	4.70	109	Moderate	Pebble/Cobble	0	0	60	0
	Wy3	7.37	89	Good	Pebble/Cobble	5	10	10	10
<b>Downstream of culvert</b>	Wy4	4.03	75	Good	Pebble/Cobble	10	100	0	0
	Wy5	6.03	73	Good	Pebble/Cobble	0	60	0	20



Figure 1 – The Electrofishing Sites Chosen For Fish Monitoring Relating To The Scoop Hill Wind Farm Development

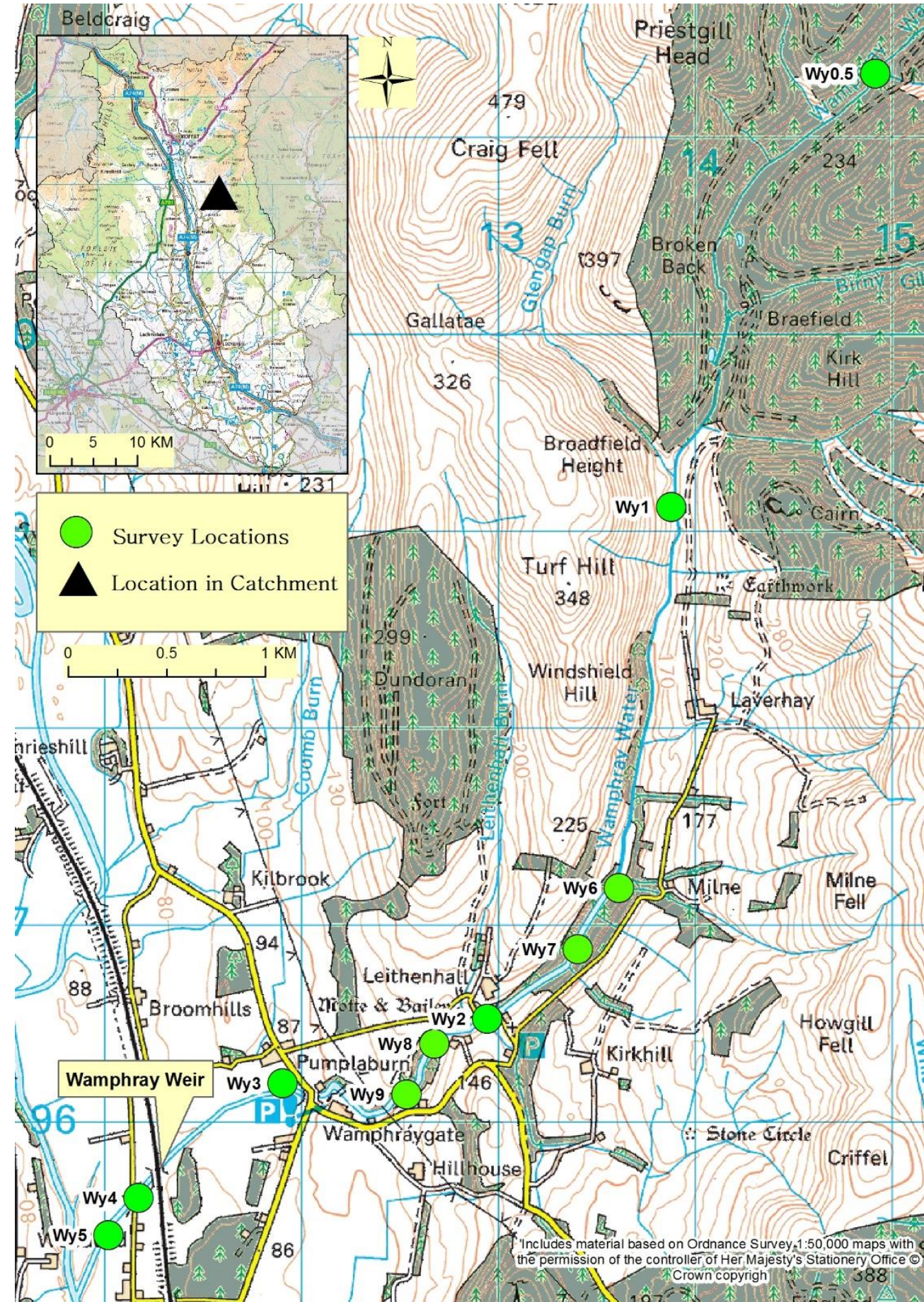




Figure 2 – Quintile Ranges for Salmon Fry Caught in 2018

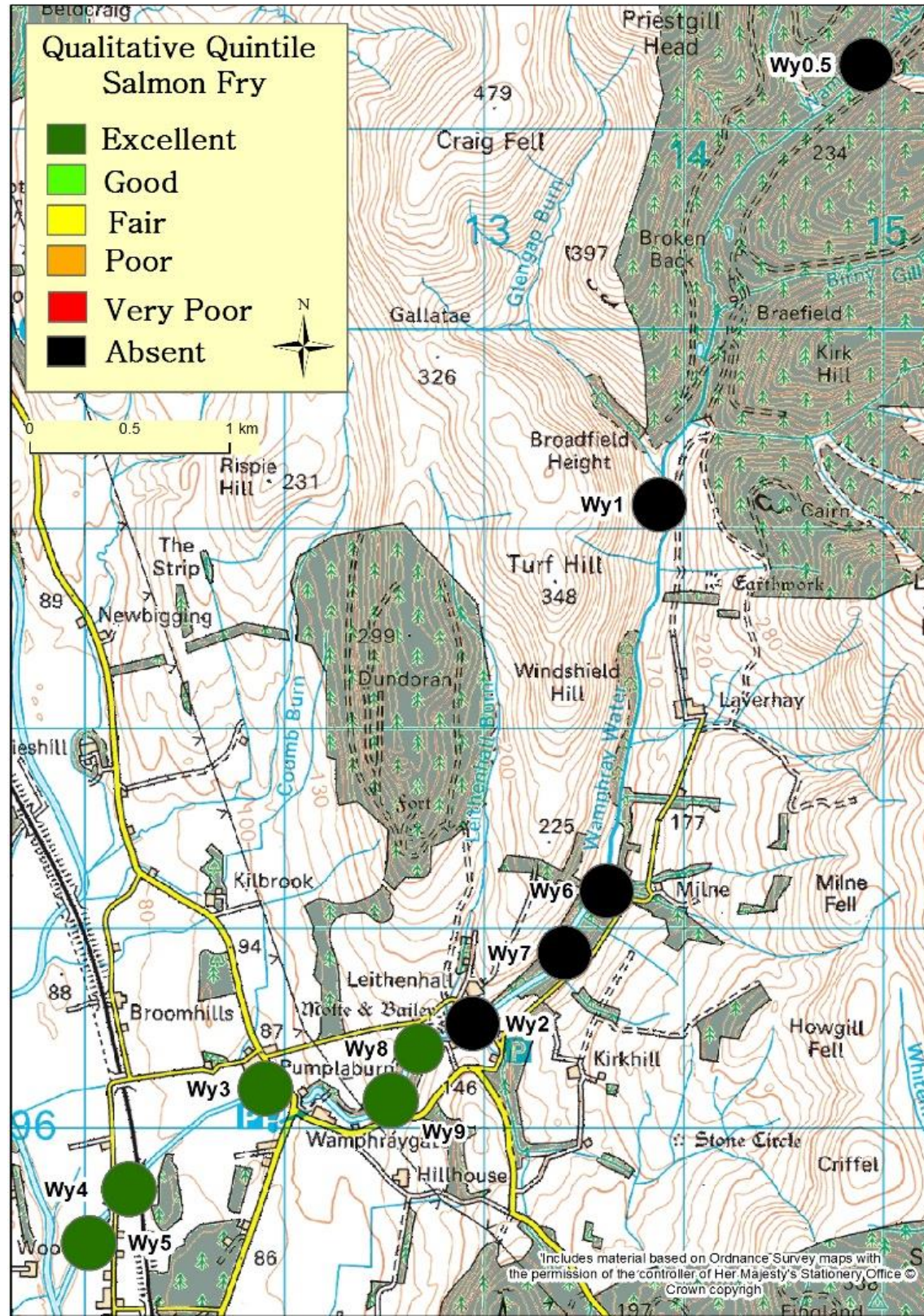


Figure 3 – Quintile Ranges for Salmon Parr Caught in 2018

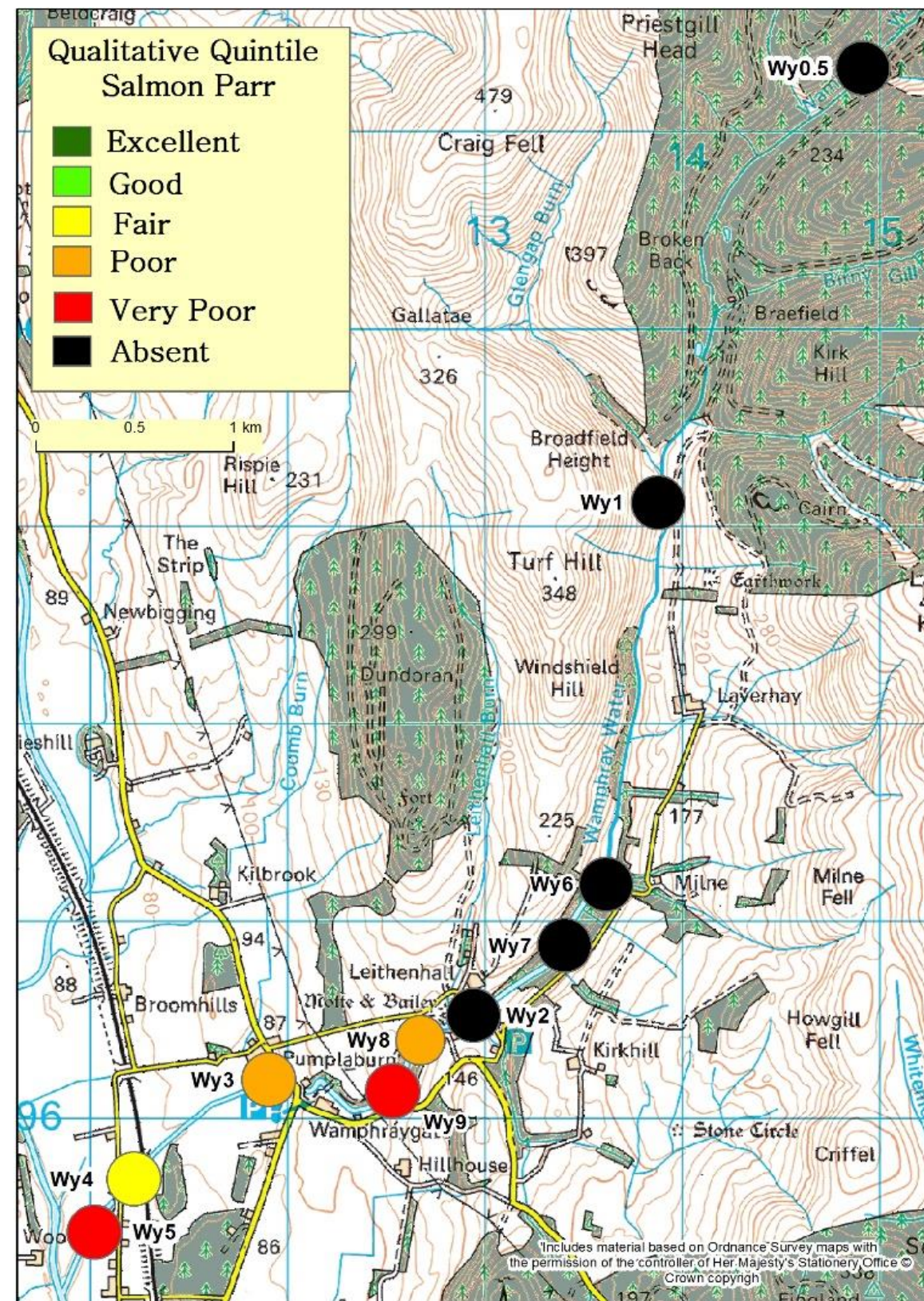




Figure 4 – Quintile Ranges for Trout Fry Caught in 2018

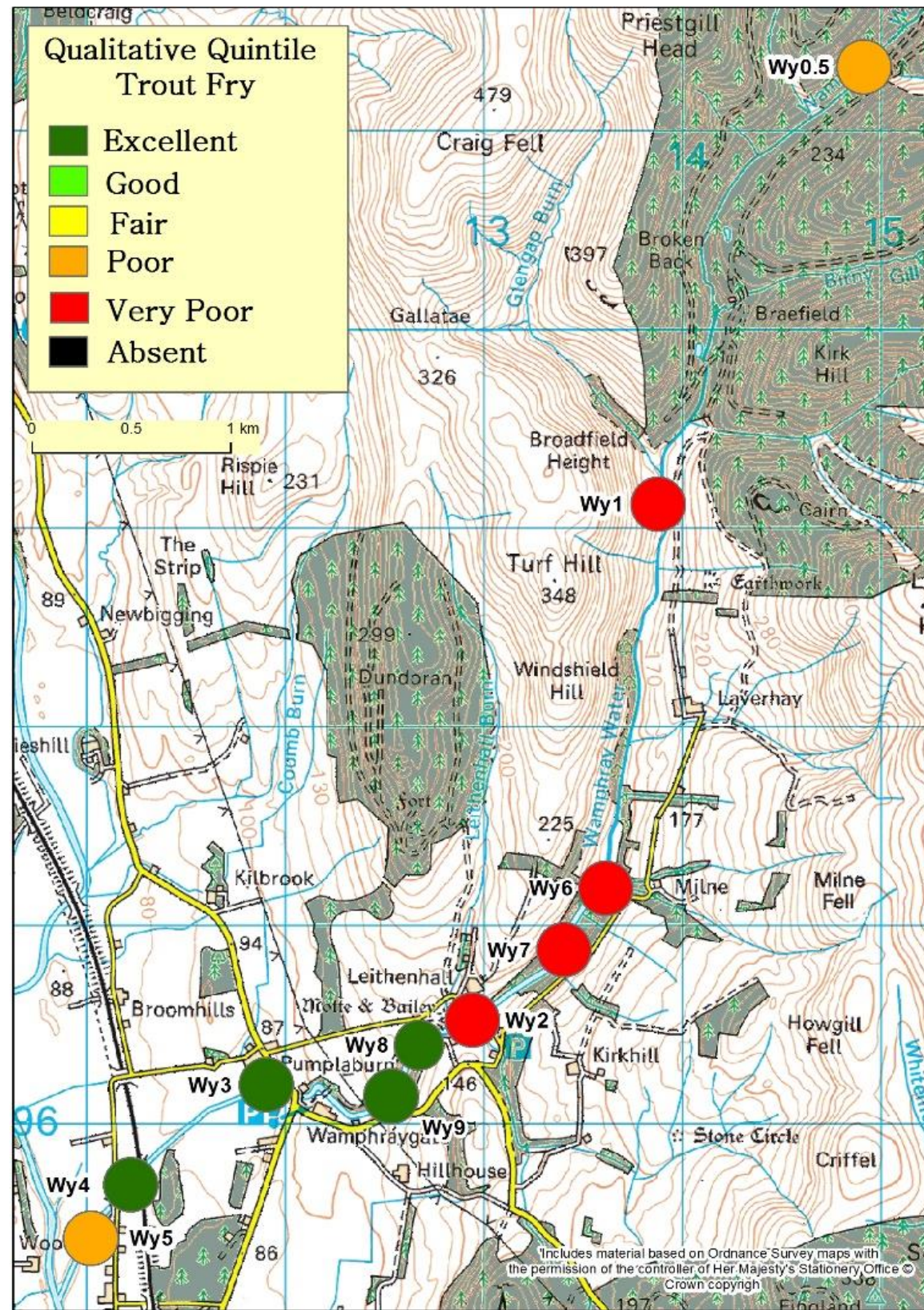


Figure 5 – Quintile Ranges for Trout Parr Caught in 2018

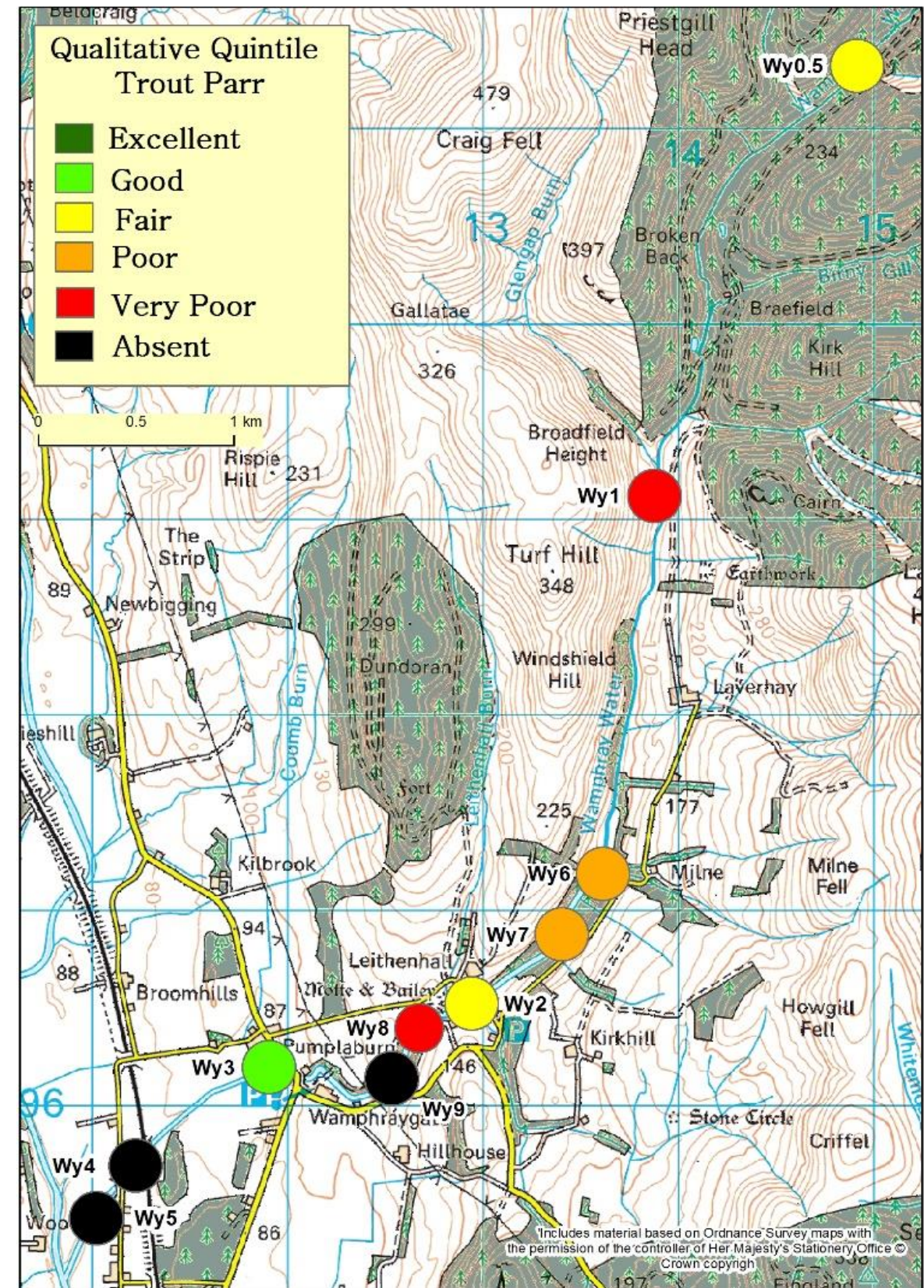




Figure 6 – Habitat Quality At All Sites in 2018

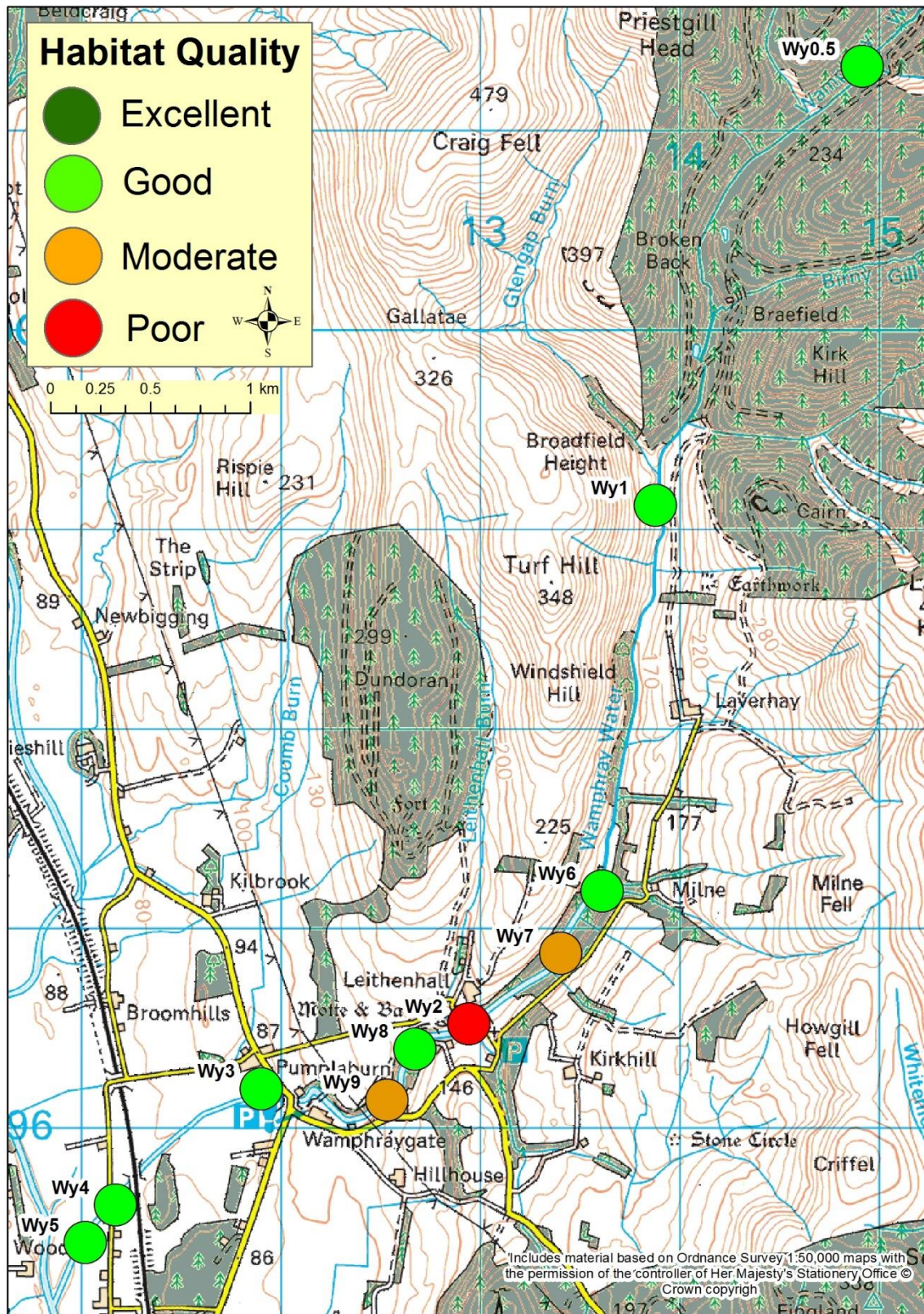
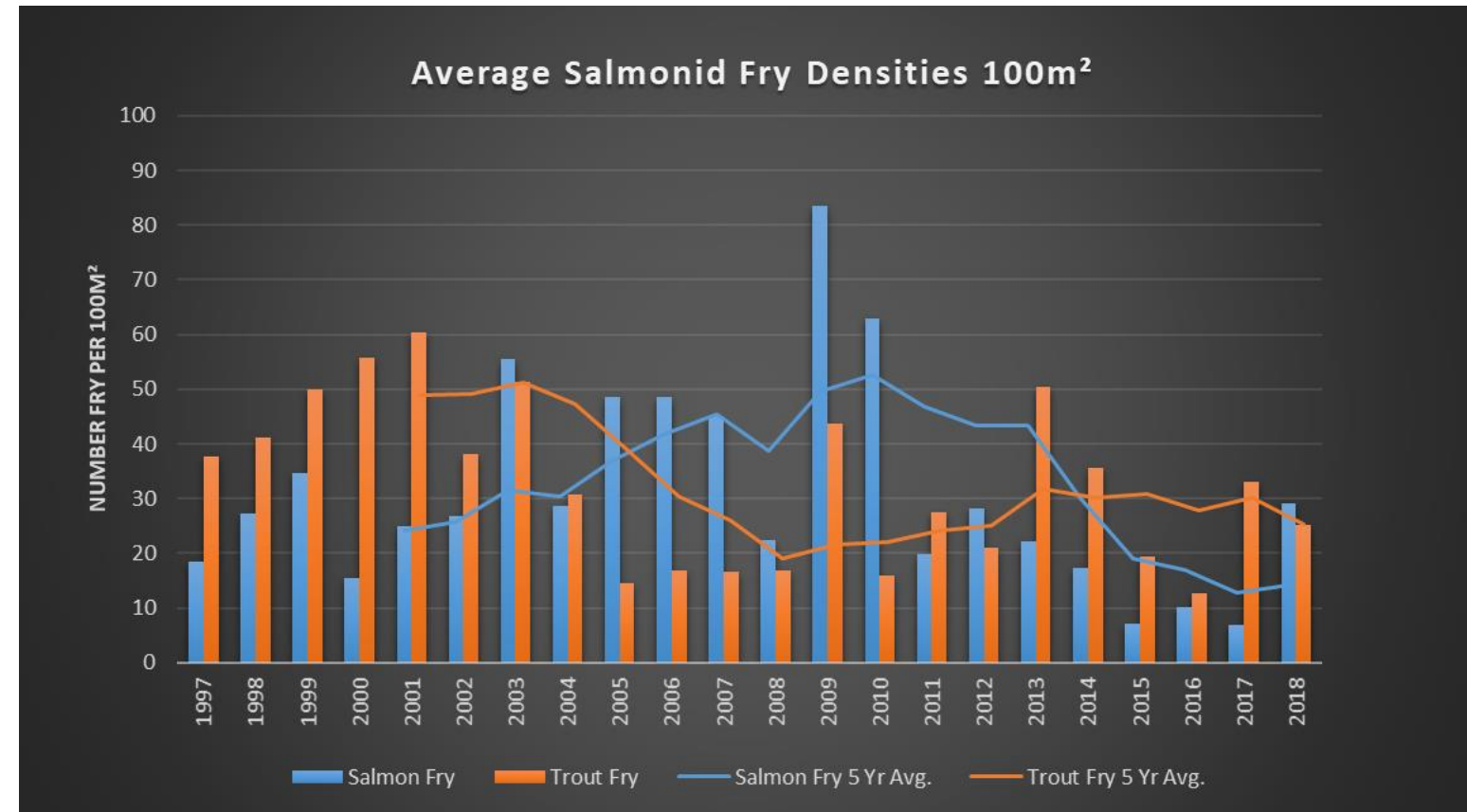


Figure 7 – Average Annual Salmon and Trout Fry Density Data Obtained from 1380 Electrofishing Surveys Conducted Between 1997 - 2018



### 5: Appendix

<b>Eastings:</b> 314926	<b>Northing:</b> 601326	<b>Site code:</b> Wy0.5	<b>Altitude:</b>
<b>River:</b> Wamphray Water			
<b>Site situation:</b> Start at confluence of burn from Ruegill Hill			
<b>Access/permission:</b>			<b>Date:</b> 06/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 3
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

#### Dimensions

<b>Wet Width Area (m<sup>2</sup>):</b> 114.6	<b>Site Length (m):</b> 30.0
<b>Bed Width Area (m<sup>2</sup>):</b> 127.2	
<b>Bank Width Area (m<sup>2</sup>):</b> 132.0	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		3.9		4.0		4.3	
B	7.5		4.2		4.3		4.3	
C	15.0		4.1		4.5		4.5	
D	22.5		3.9		3.9		3.9	
E-Downst	30.0		3.0		4.5		5.0	

#### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	30	20	10	10	0

#### Instream

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	10	20	30	30	10	0	0	100

#### Flow

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	10	10	20	20	20	10	100

#### Bank

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	0
<b>Bankface Veg.</b>	Uniform	Uniform
<b>Banktop Veg.</b>	Simple	Uniform
<b>Overhang Bough (%)</b>	10	0
<b>Canopy Cover (%)</b>	5	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

#### Other

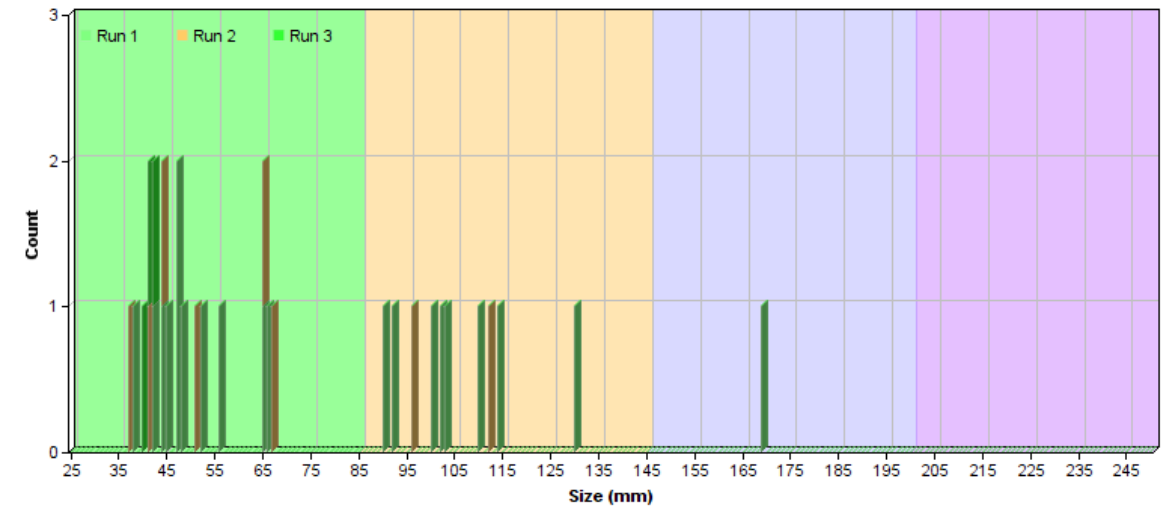
<b>Team Leader:</b>	Tony Donnelly
<b>Number of Staff:</b>	3
<b>Survey Purpose:</b>	Monitoring
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	300
<b>Amps:</b>	0.2
<b>Smooth / Pulsed:</b>	Smooth
<b>Manufacturer:</b>	ElectraFish
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	80

<b>Temperature:</b>	12.00
<b>Time:</b>	11:00



<b>Water Level:</b>	Medium
<b>Water Clarity:</b>	Clear
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	✓

4++								4++										
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Other Fish Species Count

Species	Count

Brown Trout (Sea Trout) Density Report

- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	11	6	3	0	0	20	20.464	18.325	9.599	17.452	48	9.824	
1+	8	2	0	0	0	10	8.776	8.726	6.981	8.726	104	11.986	
2+	1	0	0	0	0	1			0.873	0.873	169		
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	20	8	3	0	0	31							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	20.464	13.165	27.763	7.299	0.472	0+	18.325	16.09	20.56	2.235	0.571
1+	8.776	8.307	9.245	0.469	0.821	1+	8.726	8.726	8.726	.	0.833
2+						2+					
3+						3+					

<b>Eastings:</b> 313875	<b>Northings:</b> 599125	<b>Site code:</b> Wy1	<b>Altitude:</b> 170
<b>River:</b> Wamphray Water			
<b>Site situation:</b> Laverhay farm upstream thor beck downstream of chapple lea			
<b>Access/permission:</b> Left Bank: Laverhay Right Bank: Laverhay			<b>Date:</b> 06/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 1
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

<b>Wet Width Area (m²):</b> 53.0	<b>Site Length (m):</b> 11.2
<b>Bed Width Area (m²):</b> 60.9	
<b>Bank Width Area (m²):</b> 61.2	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	5.2	5.2	5.2	5.2
B	6.0	4.0	4.9	4.9	5.0
C-Downst	11.2	5.0	6.2	6.2	6.2

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	50	40	0	0	0

**Instream**

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	5	0	15	30	40	10	0	0	100

**Flow**

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total

0	0	0	0	20	65	15	0	100
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**Bank**

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	15
<b>Bankface Veg.</b>	Uniform	Complex
<b>Banktop Veg.</b>	Simple	Complex
<b>Overhang Bough (%)</b>	0	95
<b>Canopy Cover (%)</b>	10	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	15	100	85	0	0	0	0	0	0	0	0	100	100

**Other**

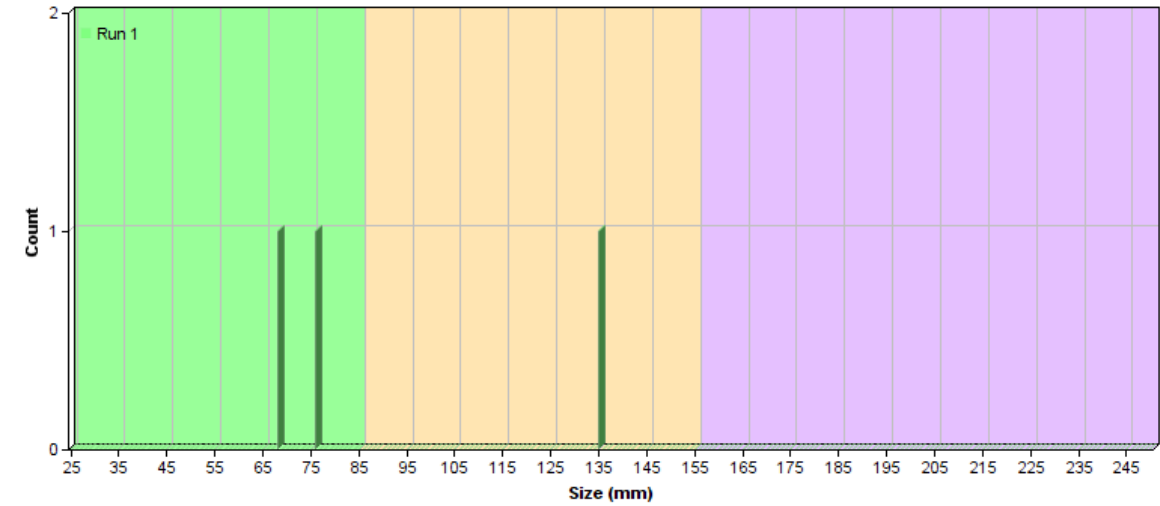
<b>Team Leader:</b>	Tony Donnelly
<b>Number of Staff:</b>	3
<b>Survey Purpose:</b>	Contract (Other than SAC or WFD)
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	310
<b>Amps:</b>	
<b>Smooth / Pulsed:</b>	Smooth
<b>Manufacturer:</b>	ElectraFish
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	

<b>Temperature:</b>	
<b>Time:</b>	
<b>Water Level:</b>	Medium
<b>Water Clarity:</b>	Clear
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Yes

<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	✓

**Other Fish Species Count**

Species	Count



**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	2	0	0	0	0	2			3.773	3.773	72	5.657	
1+	1	0	0	0	0	1			1.886	1.886	135		
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	3	0	0	0	0	3							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 313610	Northing: 597190	Site code: Wy6	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 06/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 100.2	Site Length (m): 15.6
Bed Width Area (m <sup>2</sup> ): 117.8	
Bank Width Area (m <sup>2</sup> ): 131.4	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.5		8.2		9.0	
B	5.2		6.3		7.0		7.5	
C	10.4		5.5		6.7		8.2	
D-Downst	15.6		7.4		8.3		9.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
60	40	0	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	35	50	5	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	70	20	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	10
Bankface Veg.	Uniform	Simple
Banktop Veg.	Uniform	Simple
Overhang Bough (%)	0	10
Canopy Cover (%)	10	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	10	100	90	0	0	0	10	0	0	0	0	100	110

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear



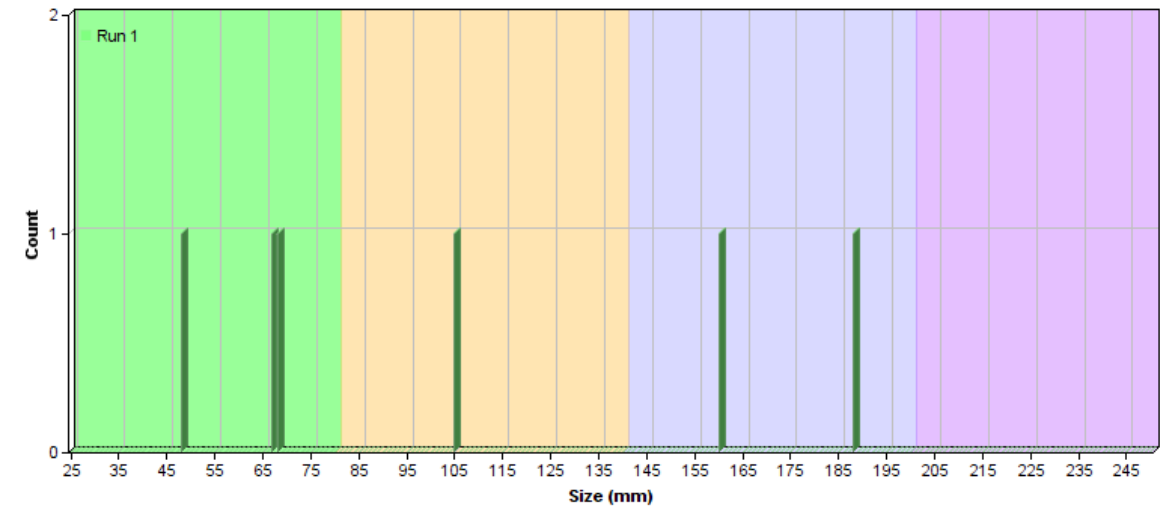
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

**Brown Trout (Sea Trout) Density Report**

- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.



Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	3	0	0	0	0	3			2.993	2.993	61	11.269	
1+	1	0	0	0	0	1			0.998	0.998	105		
2+	2	0	0	0	0	2			1.995	1.995	174	19.799	
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	6	0	0	0	0	6							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 313400	Northing: 596880	Site code: Wy7	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 06/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

### Dimensions

Wet Width Area (m <sup>2</sup> ): 84.4	Site Length (m): 15.0
Bed Width Area (m <sup>2</sup> ): 105.8	
Bank Width Area (m <sup>2</sup> ): 123.8	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		5.3		6.8		8.0	
B	5.0		4.8		7.2		8.2	
C	10.0		6.4		7.5		8.4	
D-Downst	15.0		6.0		6.7		8.4	

### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	40	30	0	0	0

### Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Partly
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	5	15	30	40	10	0	0	100

### Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	30	70	0	0	100

### Bank

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Complex
Overhang Bough (%)	100	100
Canopy Cover (%)	80	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

### Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	16:00
Water Level:	Medium
Water Clarity:	Clear

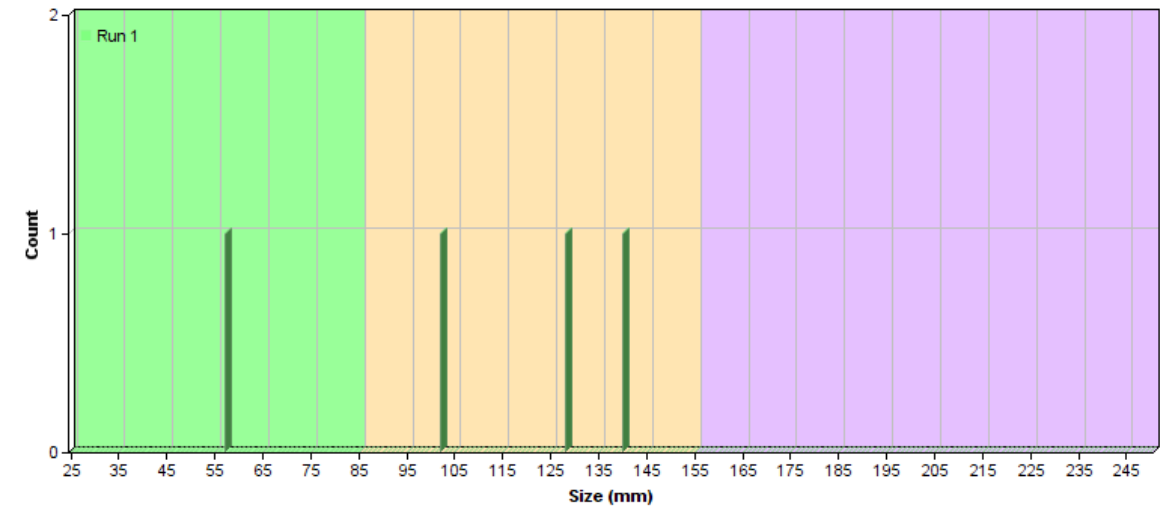
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.



Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	0	0	0	0	1			1.185	1.185	57		
1+	3	0	0	0	0	3			3.555	3.555	123	19.425	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	4	0	0	0	0	4							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 312939	Northing: 596526	Site code: Wy2	Altitude: 100
River: Wamphray Water			
Site situation: first riffle d/s bridge at Leithenhall (top of site)			
Access/permission: Left Bank: Annan DSFB Right Bank: same			Date: 07/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Poor	Target Species: Atlantic Salmon (Salmo salar)

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 103.4	Site Length (m): 19.7
Bed Width Area (m <sup>2</sup> ): 146.8	
Bank Width Area (m <sup>2</sup> ): 161.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		5.8		6.9		7.0	
B	6.5		5.1		5.9		6.7	
C	13.0		5.2		6.8		8.0	
D-Downst	19.7		4.9		10.2		11.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	10	20	20	20	20

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Unstable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	10	10	10	10	0	60	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	15	15	40	20	10	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	20
Bankface Veg.	Bare	Complex
Banktop Veg.	Simple	Complex
Overhang Bough (%)	0	100
Canopy Cover (%)	50	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	20	0	0	100	80	0	0	0	20	0	0	0	0	100	120

**Other**

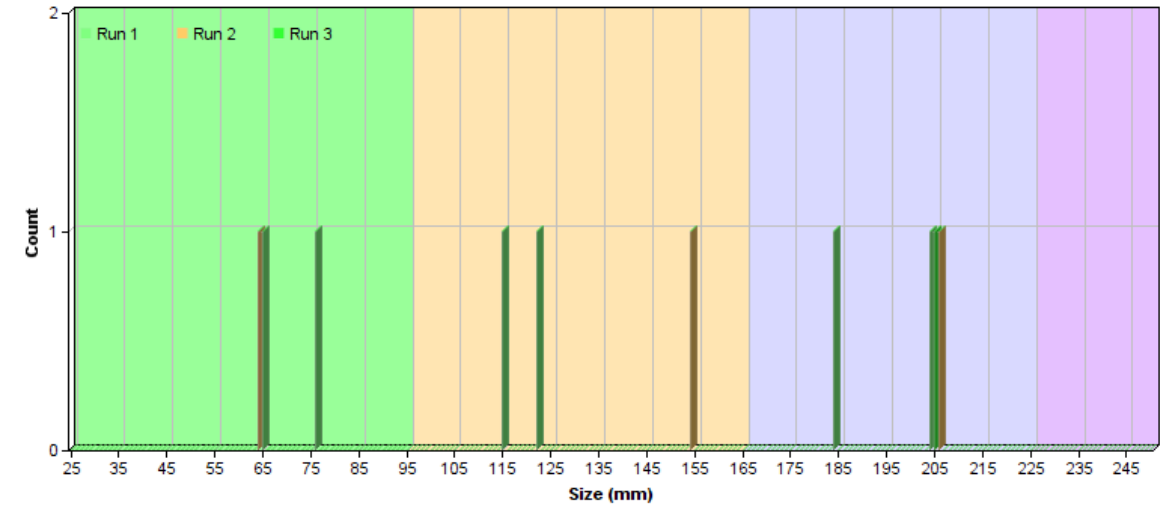
Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	14.00
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear



<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

4++								4++							
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**Other Fish Species Count**

Species	Count

**Brown Trout (Sea Trout) Density Report**

The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	2	1	0	0	0	3	2.973	2.901	1.934	2.901	68	6.658	
1+	2	1	0	0	0	3	2.973	2.901	1.934	2.901	130	20.793	
2+	2	1	1	0	0	4	5.665	3.868	1.934	3.868	199	10.532	
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	6	3	1	0	0	10							
Trout Missed						(NaN)							

Zippin						Carle & Strub						
Age	Estimate	Confidence Levels			Probability		Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%					Lower	Upper	95%	
0+	2.973	2.28	3.666	0.693	0.71	0+	2.901	2.901	2.901	.	0.75	
1+	2.973	2.28	3.666	0.693	0.71	1+	2.901	2.901	2.901	.	0.75	
2+	5.665	- 4.855	16.185	10.52	0.318	2+	3.868	3.868	3.868	.	0.571	
3+						3+						

Eastings: 312529	Northing: 596143	Site code: Wy9	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 07/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 65.8	Site Length (m): 14.0
Bed Width Area (m <sup>2</sup> ): 65.8	
Bank Width Area (m <sup>2</sup> ): 65.8	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	6.3	6.3	6.3	6.3
B	3.0	5.7	5.7	5.7	5.7
C	7.0	5.1	5.1	5.1	5.1
D	10.0	3.6	3.6	3.6	3.6
E-Downst	14.0	2.8	2.8	2.8	2.8

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
30	40	20	10	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	50	30	0	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	10	90	0	0	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Simple	Uniform
Banktop Veg.	Simple	Uniform
Overhang Bough (%)	60	0
Canopy Cover (%)	40	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	130

Temperature:	14.00
Time:	11:00
Water Level:	Medium
Water Clarity:	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

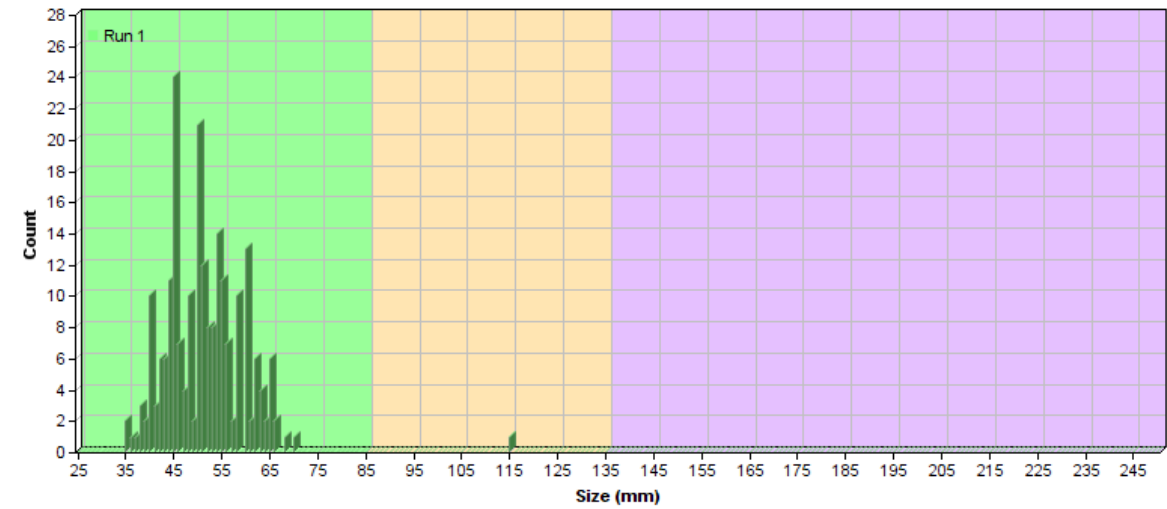
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	222	0	0	0	0	222			337.386	337.386	50	7.403	
1+	1	0	0	0	0	1			1.520	1.520	115		
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>223</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>223</b>							
Salmon Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

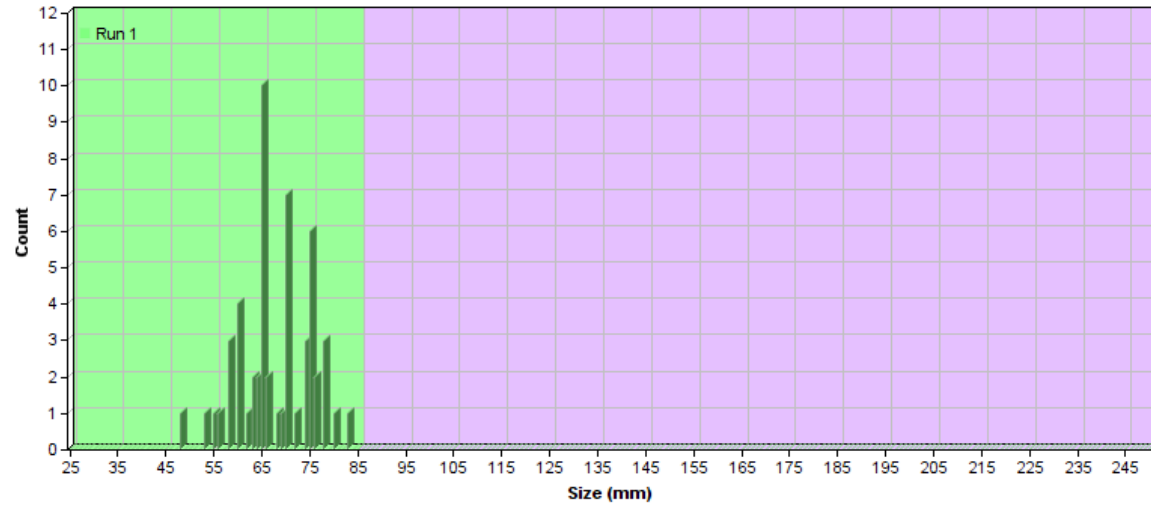


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	54	0	0	0	0	54			82.067	82.067	67	7.447	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>54</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>54</b>							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Eastings: 311900	Northing: 596200	Site code: Wy3	Altitude: 90
River: Wamphray Water			
Site situation: Below road bridge at Pumplaburn Farm			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 05/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 112.1	Site Length (m): 15.2
Bed Width Area (m <sup>2</sup> ): 112.1	
Bank Width Area (m <sup>2</sup> ): 129.6	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		7.7		7.7		8.4	
B	5.0		5.9		5.9		9.0	
C	10.0		8.0		8.0		8.7	
D-Downst	15.2		7.9		7.9		8.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
80	20	0	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
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Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	15	25	50	10	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	20	70	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	5	10
Bankface Veg.	Bare	Simple
Banktop Veg.	Simple	Complex
Overhang Bough (%)	10	10
Canopy Cover (%)	20	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	5	10	95	90	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	6
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish



Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	120

Temperature:	13.50
Time:	00:12
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

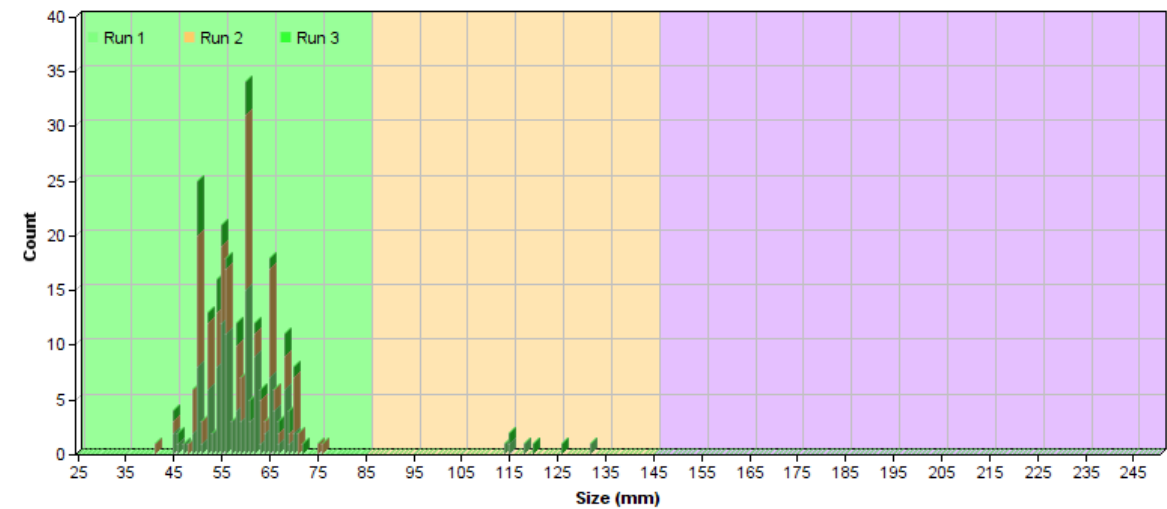
**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	115	104	31	0	0	250	281.026	276.539	102.587	223.015	58	6.572	
1+	4	0	3	0	0	7	13.108	6.244	3.568	6.244	120	6.708	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	119	104	34	0	0	257							

Salmon Missed	(NaN)
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Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	281.026	241.266	320.786	39.76	0.409	0+	276.539	241.069	312.009	35.47	0.419
1+	13.108	-28.002	54.218	41.11	0.194	1+	6.244	6.244	6.244	.	0.538
2+						2+					
3+						3+					
4++						4++					



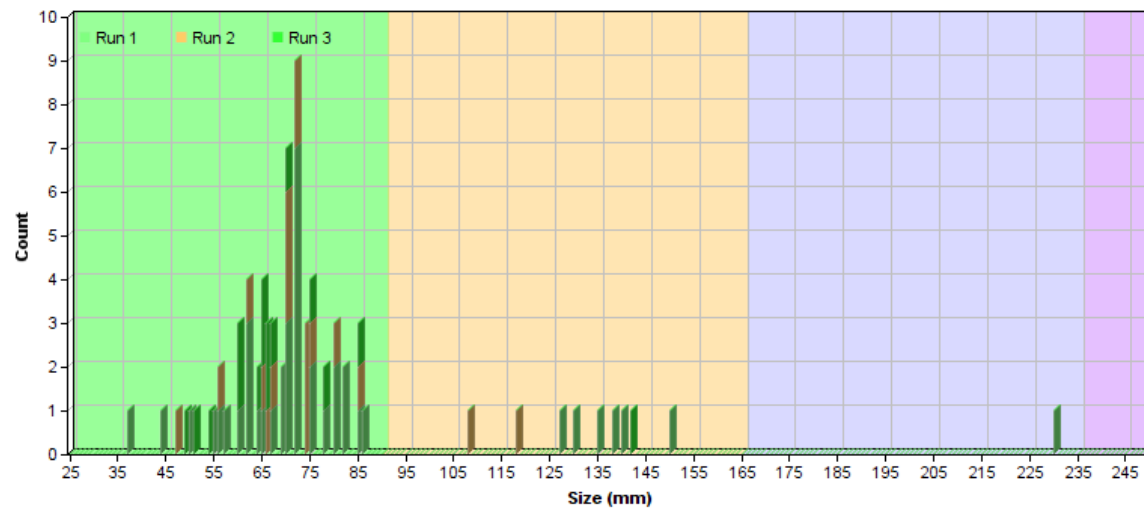
**Brown Trout (Sea Trout) Density Report**

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Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	34	17	15	0	0	66	79.927	74.933	30.330	58.876	67	10.253	
1+	6	2	1	0	0	9	8.514	8.029	5.352	8.029	132	12.913	
2+	1	0	0	0	0	1			0.892	0.892	230		
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	41	19	16	0	0	76							

Trout Missed	(NaN)
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Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	79.927	50.978	108.876	28.949	0.359	0+	74.933	55.506	94.36	19.427	0.395
1+	8.514	6.452	10.576	2.062	0.615	1+	8.029	8.029	8.029	.	0.692
2+						2+					
3+						3+					
4++						4++					



Eastings: 311169	Northing: 595618	Site code: Wy4	Altitude: 70
River: Wamphray Water			
Site situation: d/s railway crossing, 50m u/s road bridge			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 09/09/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

### Dimensions

Wet Width Area (m <sup>2</sup> ): 100.6	Site Length (m): 25.0
Bed Width Area (m <sup>2</sup> ): 176.9	
Bank Width Area (m <sup>2</sup> ): 221.9	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	4.3	6.6	8.4	
B	8.0	4.2	6.5	8.7	
C	16.0	4.0	6.9	8.8	
D-Downst	25.0	3.6	8.3	9.6	

### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	30	40	0	0	0

### Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	30	35	15	0	0	100

### Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	30	40	30	0	100

### Bank

	Left Bank	Right Bank
Total Fish Cover (%)	10	100
Bankface Veg.	Uniform	Bare
Banktop Veg.	Simple	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	50	10	0	90	0	0	0	0	0	0	100	0	0	100	150

### Other

Team Leader:	Chris Stones
Number of Staff:	4
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	
Equipment Type:	Backpack
Volts:	280
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	

Temperature:	
Time:	10:00
Water Level:	Medium
Water Clarity:	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

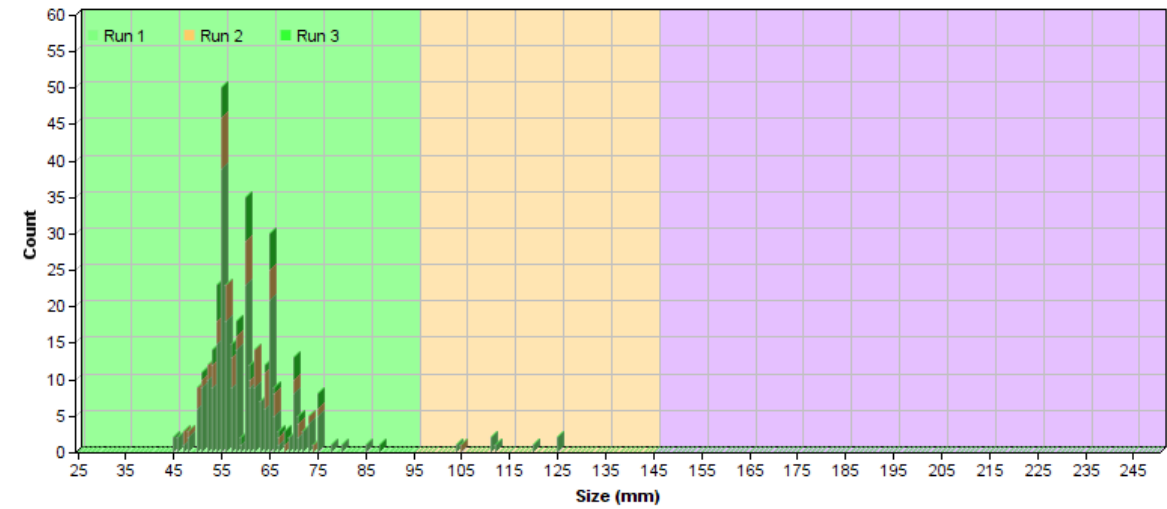
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	245	66	42	0	0	353	369.189	367.684	243.466	350.790	59	6.906	
1+	7	1	0	0	0	8	7.962	7.95	6.956	7.950	114	8.288	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>252</b>	<b>67</b>	<b>42</b>	<b>0</b>	<b>0</b>	<b>361</b>							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	369.189	356.264	382.114	12.925	0.632	0+	367.684	355.719	379.649	11.965	0.637
1+	7.962	7.731	8.193	0.231	0.885	1+	7.95	7.95	7.95	.	0.889
2+						2+					
3+						3+					
4++						4++					



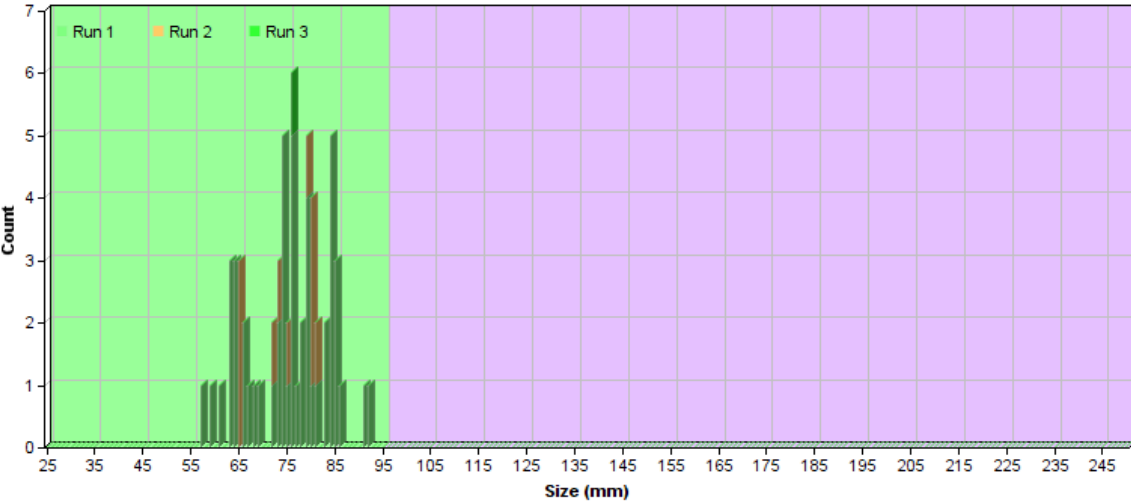
**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	50	11	1	0	0	62	62.017	61.612	49.687	61.612	75	8.121	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>50</b>	<b>11</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>62</b>							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	62.017	60.583	63.451	1.434	0.813	0+	61.612	61.612	61.612	.	0.827
1+						1+					
2+						2+					
3+						3+					
4++						4++					





**SFCC Electrofishing Event Report**

<b>Easting:</b> 311017	<b>Northing:</b> 595428	<b>Site code:</b> Wy5	<b>Altitude:</b>
<b>River:</b> Wamphray Water			
<b>Site situation:</b> 150 metres D/s of road bridge			
<b>Access/permission:</b>			<b>Date:</b> 09/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 3
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

<b>Wet Width Area (m<sup>2</sup>):</b> 96.4	<b>Site Length (m):</b> 16.0
<b>Bed Width Area (m<sup>2</sup>):</b> 147.6	
<b>Bank Width Area (m<sup>2</sup>):</b> 208.8	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.1		12.4		13.8	
B	5.0		6.0		9.2		12.6	
C	10.0		6.0		7.8		13.0	
D-Downst	16.0		6.0		7.5		12.8	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
80	20	0	0	0	0

**Instream**

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	30	50	10	0	0	100

**Flow**

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	10	0	30	45	15	0	100

**Bank**

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	60
<b>Bankface Veg.</b>	Uniform	Uniform
<b>Banktop Veg.</b>	Uniform	Simple
<b>Overhang Bough (%)</b>	0	20
<b>Canopy Cover (%)</b>	0	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	60	100	40	0	0	0	0	0	0	0	0	100	100

**Other**

<b>Team Leader:</b>	Chris Stones
<b>Number of Staff:</b>	4
<b>Survey Purpose:</b>	Contract (Other than SAC or WFD)
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	300
<b>Amps:</b>	0.5
<b>Smooth Pulsed:</b>	Smooth /
<b>Manufacturer:</b>	
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	

<b>Temperature:</b>	
<b>Time:</b>	13:30
<b>Water Level:</b>	Medium
<b>Water Clarity:</b>	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

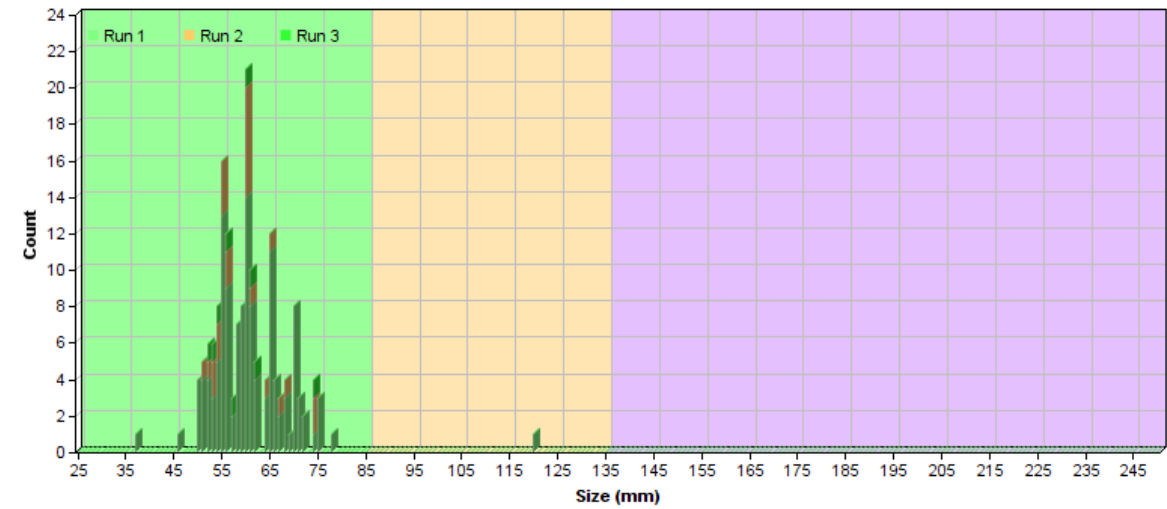
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	129	24	9	0	0	162	170.065	169.087	133.817	168.050	60	6.782	
1+	1	0	0	0	0	1			1.037	1.037	120		
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>130</b>	<b>24</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>163</b>							
Salmon Missed						(NaN)							

Zippin						Carle & Strub						
Age	Estimate	Confidence Levels			Probability		Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%					Lower	Upper	95%	
0+	170.065	166.623	173.507	3.442	0.772	0+	169.087	166.82	171.354	2.267	0.783	
1+						1+						
2+						2+						
3+						3+						
4++						4++						

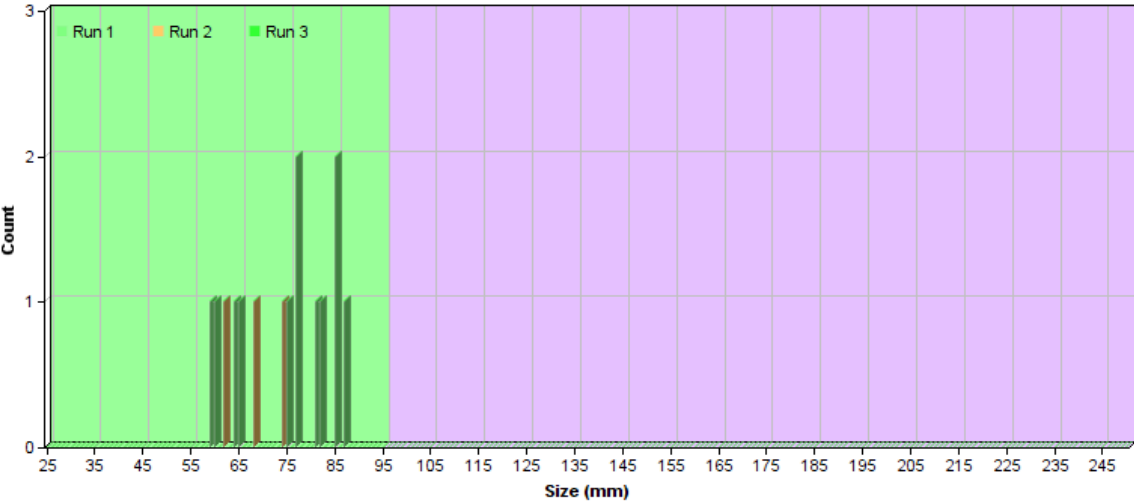


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	12	3	0	0	0	15	15.65	15.56	12.448	15.560	73	9.709	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>12</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>							
Trout Missed						(NaN)							

Zippin						Carle & Strub						
Age	Estimate	Confidence Levels			Probability		Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%					Lower	Upper	95%	
0+	15.65	14.967	16.333	0.683	0.821	0+	15.56	15.56	15.56	.	0.833	
1+						1+						
2+						2+						
3+						3+						
4++						4++						





## Section 8 ECOLOGY

8.1	Introduction.....	4
8.2	Scoping .....	4
8.3	Legislation and Guidance.....	5
8.4	Planning Policy.....	6
8.5	Methodology .....	7
8.6	Field Survey Methodologies .....	7
8.7	Ecological Impact Assessment (EclA).....	12
8.8	Desk Study .....	15
8.9	Phase 1 Habitats and NVC communities (Site Survey).....	16
8.10	Groundwater Dependent Terrestrial Ecosystems (GWDTEs).....	20
8.11	Species (Site Survey).....	21
8.12	Assessment of Impacts .....	25
8.13	Mitigation .....	28
8.14	Statement of Significance Summary .....	32

### Tables

Table 8.1 – Scoping Responses

Table 8.2 - Guidelines for assessing the potential suitability of Proposed Development sites for bats, based on the presence of habitat features within the landscape

Table 8.3 – Minimum Survey Standards for bat surveys at proposed wind farm developments

Table 8.4 – Transects and Remote Detectors for Bat Survey

Table 8.5 – Approach for Evaluating the Value or Sensitivity of Ecological Receptors in Scotland

Table 8.6 - Definition of spatial effect magnitude on IEFs

Table 8.7 – Definition of temporal effect magnitude on IEFs

Table 8.8 – Significance Levels of Effects on Habitats and Species

Table 8.9 – Groundwater Dependency Scores

Table 8.10 – Cumulative Impacts of Wind Farms and other Developments within the NHZ

### Figures

Figure 8.1 - Survey Areas

Figure 8.2 - Phase 1 Habitat Survey

Figure 8.3a - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3b - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3c - Target Notes for main central area with Laverhay Height and Milne Height

Figure 8.3d - Target Notes for north eastern area with Rue Gill Hill, Ewelairs Hill and Pot Hill

Figure 8.3e - Target Notes North western area including Dundoran Plantation

Figure 8.3f - Target Notes North western area including Dundoran Plantation

Figure 8.3g - Target Notes for south-eastern forest area including Silton Forest

Figure 8.3h - Target Notes for south-eastern forest area including Silton Forest

Figure 8.3i – Target Notes for additional areas survey in 2020

Figure 8.3j – Target Notes for additional areas survey in 2020

Figure 8.3k - Target Notes for additional areas survey in 2020

Figure 8.4 – GWDTE Within Excavation Buffers

Figure 8.5 - Routes of Bat Transects and Locations of Remote Detectors

Figure 8.6 - Fishing Survey Locations

Figure 8.7 - Otter Evidence (Non-Sensitive)

Figure 8.8 - Badger Evidence (Non-Sensitive)

Figure 8.9 - Red Squirrel and Pine Marten Evidence (Non-Sensitive)

### Appendices

Appendix 8.1 – Bat Activity Transect Routes

Appendix 8.2 – Bat Survey Dates, Times and Weather

Appendix 8.3 – Locations of Static Recorders, Dates and Times

Appendix 8.4 – Badger Sett Definitions

Appendix 8.5 – Fish Survey Locations

Appendix 8.6 – Designated Sites within 20 km of Scoop Hill

Appendix 8.7 – Desktop Results Habitats and Species

Appendix 8.8 – NVC Descriptions

Appendix 8.9 – Phase 1 Habitat Target Note Descriptions

Appendix 8.10 - Plant Species Lists

Appendix 8.11 – Results from Bat Activity Surveys

Appendix 8.12 – Results of Bat Records from Static Detectors

Appendix 8.13 – Total Number of Bat Passes per Month

Appendix 8.14 – Summary of Otter Evidence (non-sensitive data)

Appendix 8.15 – Summary of Badger Evidence (non-sensitive data)

Appendix 8.16 – Common Lizard Sightings

Appendix 8.17 – Results of Electrofishing Surveys

Appendix 8.18 – Important Ecological Features (IEFs) – Habitats

Appendix 8.19 – Important Ecological Features (IEFs) – Species

Appendix 8.20 – Dimensions used in Habitat Loss Calculations

Appendix 8.21 – Loss of Habitat Types

Appendix 8.22 – Developments within the Natural Heritage Zone

Appendix 8.23 – Residual Effects

Appendix 8.24a – Dryfe Water: Electrofishing Survey

Appendix 8.24b - Wamphray Water: Electrofishing Survey

## Glossary

Term	Definition
Cumulative effect	The combined effect of the assessed project in combination with the effects from a number of different projects, on the same single receptor/resource
Designated site	An area afforded protection under an International Convention, European Directive or a piece of UK legislation due to its nature conservation or landscape value.
Ecological Receptor	Includes any living organisms other than humans, the habitat which supports such organisms or natural resources which could be adversely affected by the development.
Effect	Term used to express the consequence of an impact. The significance of effect is determined by correlating the magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. Involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive, including the publication of an Environmental Impact Assessment Report.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Magnitude	A combination of the extent, duration, frequency and reversibility of an impact.
Mitigation	Measures (which may include process or design) intended to avoid, reduce and where possible, remedy significant adverse impacts of a development.
Remote Detector	Bat detectors left in situ over a number of days in strategic points to record bat activity.
Sensitivity	The extent to which a study subject can accept a change of a particular type and scale without unacceptable adverse effects.
Significance	The significance of an effect combines the evaluation of the magnitude of an impact and the sensitivity of the receptor.
Site of Special Scientific Interest	Sites providing statutory protection for the best examples of the UK's flora, fauna, or geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations.
Special Area of Conservation	Protected sites designated under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high - quality conservation sites that will make a significant contribution to

	conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended)
Special Protection Area	Sites providing statutory protection for a number of rare, threatened or vulnerable bird species and also for regularly occurring migratory species

## Abbreviations

Abbreviation	Description
ASSI	Area of Special Scientific Interest
BCT	Bat Conservation Trust
BTO	British Trust for Ornithology
DGC	Dumfries and Galloway Council
EclA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GWDTE	Groundwater Dependent Terrestrial Ecosystem
LBAP	Local Biodiversity Action Plan
MSS	Marine Scotland Science
NHZ	Natural Heritage Zone
NNR	National Nature Reserve
NVC	National Vegetation Classification
pSAC	Proposed Special Area for Conservation
pSPA	Proposed Special Protection Area
RSPB	Royal Society for the Protection of Birds
SAC	Special Area for Conservation
SEPA	Scottish Environmental Protection Agency
SNCO	Statutory Nature Conservation Organisation
NatureScot	Previously known as Scottish Natural Heritage (SNH)
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
ZOI	Zone of Influence

## Section 8: Ecology

### 8.1 Introduction

8.1.1 This section describes the Ecological Impact Assessment (EclA) of the proposed Scoop Hill Community Wind Farm development, as required by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017. It does not include an assessment of impacts on the ornithology of the site, which is covered separately in Section 7 of this EIAR. Any sensitive locational information relating to badgers and otters is provided in a separate Confidential Annex due to the risk of persecution.

8.1.2 This EclA is based upon:

- An Extended Phase 1 Habitat Survey carried out by Starling Learning in 2018 and 2019;
- An NVC survey carried out by Starling Learning over the same period;
- Protected species surveys carried out by Starling Learning over the same period;
- Fish surveys carried out by the River Annan District Salmon Fishery Board which are for the Dryfe and Wamphray in summer 2018; and
- Existing records of protected habitats/species provided through consultation.

8.1.3 The aims of this EclA are to:

- Establish a robust and accurate ecological baseline for the site;
- Identify and evaluate the nature conservation/biodiversity interest present;
- Identify any potential impacts arising from the development proposals (construction and operational stages);
- Establish the magnitude and significance of those identified impacts;
- Identify mitigation measures to address the significant impacts;
- Assess cumulative impacts from other surrounding developments; and
- Assess any residual impacts and the need for any compensation.

### 8.2 Scoping

8.2.1 During the scoping stage of the EIA process, a Scoping Report was submitted to the Scottish Government (SG), Scottish Ministers and distributed to a number of statutory consultees including Dumfries and Galloway Council (DGC), NatureScot, Scottish Environment Protection Agency (SEPA), Marine Scotland Science (MSS), Community Councils and the Royal Society for the Protection of Birds (RSPB), to indicate the subjects to be covered within the EIAR. Scoping Responses relating to ecology were subsequently received from all parties, and a summary of their main comments is provided in the table below.

**Table 8.1 – Scoping Responses**

Consultees	Community Windpower Response
<b>Scottish Government</b>	
The proposed site is in close proximity to River Tweed Special Area of Conservation (SAC), Dryfe Water Site of Special Scientific Interest (SSSI), and NatureScot would expect measures are taken to assure no impact or significant effect on	Designated sites will be considered in the Environmental Impact Assessment with measures taken to ensure no significant impacts on them.

either.	
The mitigation measures suggested for any significant environmental impacts identified should be presented as a conclusion to each chapter. Applicants are also asked to provide a consolidated schedule of all mitigation measures proposed in the environmental assessment report, provided in tabular form, where that mitigation is relied upon in relation to reported conclusions of likelihood or significance of impacts.	All ecological impacts will be identified, and their significance assessed, mitigation will be put in place and any residual impacts discussed.
<b>Scottish Ministers</b>	
Core Paths - Access along these routes should not be restricted, diverted or closed.	Core Paths will be enhanced by the provision of signage providing information on the wildlife of the area.
There is potential flood risk including downstream at Wamphray and Newton.	The Habitat Management Plan (HMP) will include measures for bog enhancement, ponds and riparian planting of the headwaters of a number of watercourses and broad-leaved native tree planting on site. These measures will help to hold water on the site and reduce the risk of flooding.
Developer needs to manage surface runoff from the site during and after construction. Runoff should mimic that of existing conditions and not be increased.  Developer should consider the rate of runoff into the watercourses which are located within the site. Any significant increase may increase the flood risk downstream.	The Construction and Environmental Management Plan (CEMP) will ensure robust measures are put in place to ensure run off is managed within best practice guidelines in order that run off and flood risk are not increased. All measures will also be detailed within the SEPA Construction Site Licence Application.
<b>Marine Scotland Science</b>	
MSS advises that the developer considers the following in the Environmental Impact Assessment. <ul style="list-style-type: none"> <li>• That salmon is listed under the European Habitats Directive and both salmon and trout are listed as priority species for conservation in the Scottish Biodiversity List. Furthermore, the River Tweed is a SAC, with the presence of salmon being a primary reason for this designation status;</li> <li>• That the results from site characterisation surveys for water quality (turbidity and stage data) and fish populations should be presented in the Environmental Impact Assessment Report (EIAR) along with detailed accounts of all proposed monitoring programmes;</li> <li>• The potential impact of felling on the water quality and aquatic biota and included in the water quality monitoring programme;</li> <li>• The potential cumulative impacts of adjacent wind farm developments on the water quality and aquatic biota; and</li> <li>• That the Tweed Foundation, River Tweed Commission, Annan District Salmon Fishery Board and River Annan Trust should be contacted, if not already done so.</li> </ul>	A freshwater ecology survey will be undertaken by an appointed consultant to establish the freshwater ecological baseline in the watercourses surrounding the development area and in order for CWL to understand the potential impacts on the ecosystems. As part of the consultation process for Scoop Hill Community Wind Farm, CWL will look to consult with local fishery boards to ensure the impact of the development is kept to a minimum.  The Gatecheck stage 1 report stated: "Fish ecology and habitat reports have been undertaken by the River Annan District Salmon Fishery Board."
<b>Scottish Environmental Protection Agency (SEPA)</b>	
SEPA highlighted the need for the provision of detailed	Community Windpower subsequently met with SEPA



<p>information on the presence of peat at the site in the form of a peat management plan which details the quantities, types and proposed reuse of the disturbed peat, the strategy for any forest felling (any reuse of forestry waste must be justified in terms of delivering increased biodiversity/ habitat), the identification of any Private Water Supplies and the source of any stone required for the provision of new site access tracks.</p> <p>A plan was requested showing how and where any timber residues will be re-used for ecological benefit within that area, supported by a HMP.</p>	<p>on the 18<sup>th</sup> December 2019 to discuss their exact requirements and the specifics set out in SEPA’s Scoping Response. CWL noted the information requirements and committed to address the points raised in the EIAR including:</p> <ul style="list-style-type: none"> <li>• The preparation and submission of a draft outline CEMP;</li> <li>• The preparation and submission of a PMP;</li> <li>• an assessment of GWDTE including a map of GWDTEs and a table with their description;</li> <li>• A dedicated forestry chapter that will include the assessment of PWS and include details of key-hole felling and replanting; and</li> <li>• Information on borrow pits and the quality of the stone within them as SEPA are keen to establish if they are suitable.</li> </ul> <p>A site specific Pollution Prevention Plan and all other associated documentation would need to be provided post consent as part of the Site Construction License to be agreed and approved by SEPA.</p>
<p><b>NatureScot</b></p>	
<p>NatureScot has been in discussion with the consultants who are currently undertaking the ornithological survey work on behalf of CWL and are broadly satisfied with the scope and methodologies that have been adopted. The site is large and complex and NatureScot accept that there may be difficulties in obtaining ideal coverage. The assessment will need to take account of any limitations.</p> <p>We have also had direct correspondence on the scope of protected species surveys. We note that the scoping document does not make mention of an assessment of either red squirrel or pine marten, which we understood were to be considered given that many of the turbines are proposed within forestry. If these species have been scoped out due to more up to date information confirming absence from this area, this should be made clear.</p> <p>With respect to bats, we note that the guidance listed in section 7.2.1 does not make reference to the most recent joint guidance - Bats and Onshore Wind Turbines, Survey Assessment and Mitigation – January 2019. Any survey protocols should be designed with reference to this guidance.</p> <p>We are happy with the scope of survey work with respect to other ecological receptors. All surveys should follow recommended methodology. The Scoping Report identifies the close proximity of the River Tweed Special Area of Conservation (SAC) to the north of the proposal site. Whilst we believe that there is unlikely to be connectivity between the development and the SAC and the conclusion may well be one</p>	<p>The coverage has been quite good despite difficulties. It will be ensured that the assessment takes account of any limitations.</p> <p>Red squirrel and pine marten surveys will be carried out using recommended methodology.</p> <p>Much of the bat survey was carried out in 2018 prior to the 2019 document being released. However, the surveys carried out are within the scope of this guidance, and it was ensured that those carried out in 2019 followed the new guidance.</p> <p>Designated Sites will be considered within the EIA and measures taken to ensure no negative impacts.</p> <p>Meetings have been held with NatureScot to discuss methodology and results.</p>

<p>of no likely significant effect, we would expect this to be considered as part of the EIA process.</p> <p>The development boundary also surrounds Dryfe Water Site of Special Scientific Interest (SSSI), designated for its upland mixed ash woodland. In spite of the close proximity of the site to the SSSI we do not anticipate any major effects, but nonetheless will expect that necessary measures are taken to assure no impact on the SSSI, particularly during construction.</p>	
<p><b>North Milk Community Council</b></p>	
<p>NMCC drew attention to the following matters which relate to the ecology of the Scoop Hill development site:</p> <ul style="list-style-type: none"> <li>• Dryfe Water SSSI (see:- <a href="https://sitelink.nature.scot/site/544">https://sitelink.nature.scot/site/544</a>);</li> <li>• Potential increase in water run-off into watercourses during both the build and operational phases;</li> <li>• Such occurrences potentially increasing the risk of flooding for those communities further;</li> <li>• Downstream of the River Dryfe (e.g. Sibbaldbie residents) which are already have existing flooding issues; and</li> <li>• No mention is made of the management of bio-hazards during the build, e.g. Chalara die-back/ash, <i>Phytophthora ramorum</i>/larch.</li> </ul>	<p>CWL responded to say that the Designated sites will be protected, and a flood risk assessment will be undertaken as part of the EIA work. CWL also confirmed that mitigation measures will be put in place and agreed with SEPA, NatureScot or the Local Authority as required.</p> <p>Chalara die back is already widespread in the Ash trees throughout this area. The wind farm is unlikely to make any further significant difference. There is very little larch in the area so <i>Phytophthora ramorum</i> spread should not be an issue. However, this organism can also affect oak and bio hazard control will be considered within the EIA.</p>

### 8.3 Legislation and Guidance

#### Legislation

8.3.1 The following legislation has been taken into account when undertaking this assessment:

- Environmental Impact Assessment Directive 2014/52/EU;
- Wildlife & Natural Environment (Scotland) Act 2011<sup>1</sup>;
- The Wildlife and Countryside Act (as amended) (WCA) <sup>2</sup>;
- The Conservation (Natural Habitats, &c) Regulations 1994 (as amended) (‘The Habitats Regulations’) <sup>3</sup>;
- The Conservation (Natural Habitats & c) Regulations 1994, as amended in Scotland (The Habitat Regulations);<sup>4</sup>

<sup>1</sup> The UK Government (2011). *Wildlife & Natural Environment (Scotland) Act. 2011*. Available at: <http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

<sup>2</sup> The UK Government (2011). *Wildlife & Natural Environment (Scotland) Act. 2011*. Available at: <http://www.legislation.gov.uk/asp/2011/6/contents/enacted>

<sup>3</sup> The UK Government (1994). *The Conservation (Natural Habitats, &c.) Regulations. 1994*. Available at: <http://www.legislation.gov.uk/uksi/1994/2716/contents/made>

- The Nature Conservation (Scotland) Act 2004 (as amended)<sup>5</sup>;
- The Protection of Badgers Act 1992 (as amended)<sup>6</sup>;
- Wild Mammals (Protection) Act 1996<sup>7</sup>;
- The Convention for the Conservation of European Wildlife and Natural Habitat (The Bern Convention) 1979;
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (the ‘Habitats Directive’)<sup>8</sup>;
- Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life (the ‘Freshwater Fish Directive’)<sup>9</sup>, transposed into Scots law by the Surface Waters (Fish life) (Classification) (Scotland) Regulations 1997<sup>10</sup>;
- Council Directive 2000/60/EC (‘Water Framework Directive’)<sup>11</sup>, transposed into Scots law by the Water Environment and Water Services (Scotland) Act 2003 (the WEWS Act)<sup>12</sup>;
- Salmon and Freshwater Fisheries Act 1975<sup>13</sup>;

- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003<sup>14</sup>; and
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (‘the 2017 EIA Regulations’)<sup>15</sup>.

### Guidance

8.3.2 Relevant nature conservation policy or guidance that gives rise to locally-designated sites and habitats and species of conservation interest, as detailed in this assessment, include:

- The Institute of Ecology and Environmental Management (2006) Guidance for Ecological Impact Assessment in the United Kingdom;
- Scottish Executive Guidance on European Protected Species, Development Sites and the Planning System (Scottish Executive, 2001);
- Scottish Planning Policy (Scottish Government, 2010);
- PAN 58: Environmental Impact Assessment (Scottish Executive, 1998);
- PAN 60: Planning for Natural Heritage (Scottish Executive, 2000);
- The Consolidated Scottish Planning Policy Statement 2010;
- UK Biodiversity Action Plan;
- Scottish Biodiversity List;
- A Handbook on Environmental Impact Assessment, NatureScot, 2018;
- Bat Surveys for Professional Ecologists – Good Practice Guidelines produced by Bat Conservation Trust, 2016;
- Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation, produced by NatureScot *et al.*, January 2019;
- Chartered Institute of Ecology and Environmental Management (CIEEM); Guidelines for Ecological Impact Assessment in the UK and Ireland, 2018;
- Dumfries and Galloway Local Biodiversity Action Plan 2009; and
- Dumfries and Galloway Council Local Development Plan 2 (LDP2) 2019.

<sup>4</sup> The Conservation (Natural Habitats & c) Regulations 1994, as amended in Scotland (The Habitat Regulations). Available at <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-species/legal-framework/habitats-directive-and-habitats-regulations>

<sup>5</sup> The UK Government (2004). *Nature Conservation (Scotland) Act (as amended). 2004*. Available at: <http://www.legislation.gov.uk/asp/2004/6/contents>

<sup>6</sup> The UK Government (1992). *Protection of Badgers Act. 1992*. Available at: <http://www.legislation.gov.uk/ukpga/1992/51/contents>

<sup>7</sup> The UK Government (1996). *Wild Mammals (Protection) Act. 1996*. Available at: <http://www.legislation.gov.uk/ukpga/1996/3/contents>

<sup>8</sup> European Council (1992). *Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna. 1992*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20070101>

<sup>9</sup> European Council (1978). *Council Directive 78/659/EEC on the Quality of Fresh Waters needing Protection or Improvement in order to Support Fish Life (the ‘Freshwater Fish Directive’). 1978*. Available at: <http://rod.eionet.europa.eu/instruments/210>

<sup>10</sup> The Scottish Government (1997). *The Surface Waters (Fishlife) (Classification) (Scotland) Regulations. 1997*. Available at: <http://www.legislation.gov.uk/en/uksi/1997/2471/regulation/7/made>

<sup>11</sup> European Council (2000). *Council Directive 2000/60/EC, establishing a framework for the Community action in the field of water policy (‘Water Framework Directive’). 2000*. Available at: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060>

<sup>12</sup> The Scottish Government (2003). *Water Environment and Water Services (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/3/contents>. [Accessed 14/09/2015]

<sup>13</sup> The UK Government (1975). *Salmon and Freshwater Fisheries Act. 1975*. Available at: <http://www.legislation.gov.uk/ukpga/1975/51>

<sup>14</sup> The UK Government (2003). *Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act. 2003*. Available at: <http://www.legislation.gov.uk/asp/2003/15/contents>

<sup>15</sup> The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 (as amended). Available at <http://www.legislation.gov.uk/ssi/2000/320/contents/made>

## 8.4 Planning Policy

8.4.1 The Scottish Planning Policy (SPP) sets out details of national planning policy and includes the requirement for an appropriate assessment by the planning authority on any development plans or proposals which are likely to have a significant effect on natural sites, which include Special Protection Areas (SPAs), designated for their bird interest and Ramsar sites.

8.4.2 Dumfries and Galloway Planning Policy is captured in the Local Development Plan (LDP2) and includes the following policies:

**NE5: Species of International Importance**

Development proposals that would be likely to have an adverse effect on a European Protected Species will not be permitted unless it can be shown that:

- There is no satisfactory alternative;
- The development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment; and
- The development would not be detrimental to the maintenance of the population of the species at a favourable conservation status in its natural range.

**NE6: Sites of National Importance for Biodiversity and Geodiversity**

Development that affects Sites of Special Scientific Interest, not designated as International Sites, and other national nature conservation designations will only be permitted where:

- It will not adversely affect the integrity of the area or the qualities for which it has been designated; or
- Any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance.

8.4.3 There is one site with a statutory designation within the development, the Dryfe Water SSSI, an upland mixed ash woodland with botanical interest.

8.4.4 All statutory designated sites within 20km of the site boundary are described in Appendix 8.6. The River Tweed SAC, the Moffat Hills SAC, Shiel Dod SSSI, Lochwood SSSI, Lochmaben Lochs SSSI, Castle Loch SSSI, Perchhall Loch SSSI, and Black Loch SSSI are all considered within this EIA.

**8.5 Methodology****Desk Study**

8.5.1 A desktop study and consultation exercise was carried out in 2017, prior to any fieldwork, to collate existing background information on the ecology of the site. This included a search for statutory and non-statutory sites designated for their nature conservation value, records of protected or notable species within the site or surrounding habitats, which could be impacted by the scheme and habitats or features of interest. The search area for protected species records was determined by the particular species and ranged between 1km and 10km from the site boundary. The following data sources were consulted:

- NatureScot - Sitelink map;
- Forestry Commission Scotland Land Information Search;
- National Biodiversity Atlas (NBN Atlas) (only for scoping, no records from this site are included);
- SEPA;
- South West Scotland Environmental Information Centre (SWSEIC);
- The Carbon and Peatland Map. NatureScot 2016;
- The Amphibian and Reptile Conservation Trust;
- The Tweed Foundation;
- The River Tweed Commission;
- The Annan District Salmon Fishery Board;
- The River Annan Trust;

- Relevant Environmental Statements, associated documents and bird monitoring reports for developments included in the Cumulative Assessment (acquired from various sources); and
- Aerial photography.

**8.6 Field Survey Methodologies****Field Survey areas**

8.6.1 A series of habitat and species surveys were undertaken to inform this assessment, taking place from September 2017 through to October 2019 with some additional visits in 2020.

8.6.2 All of the ecology surveys were carried out by Starling Learning, except for the electrofishing surveys of the Dryfe Water and Wamphray Water which were undertaken by the River Annan District Salmon Fishery Board in summer 2018.

8.6.3 The surveys carried out by Starling Learning are listed below:

- Phase 1 habitat survey;
- National Vegetation VC;
- Bats;
- Badgers;
- Otters;
- Water voles;
- Red squirrels;
- Pine martens;
- Reptiles; and
- Amphibians.

8.6.4 Incidental records of other species such as butterflies were gathered during the field surveys and during the ornithology surveys which were also undertaken by Starling Learning.

**Phase 1 Habitat Survey Methodology**

8.6.5 The Phase 1 Habitat Survey followed the standard methodology described in 'Guidelines for Baseline Ecological Assessment'<sup>16</sup>, which augments the methods described in the 'Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit'<sup>17</sup>. Aerial photographs were used to inform the field survey and photographs taken in the field were also used to help define the boundaries between the different habitats.

8.6.6 Each habitat was classified in the field and its extent mapped onto ordnance survey maps (1:25,000). Notes were made in the field relating to dominant plants, their associates, structure of vegetation or points of general conservation/ecological interest, including the presence, or potential presence of notable or protected species on the site. Botanical taxonomic nomenclature follows that of Stace<sup>18</sup>.

<sup>16</sup> Spon. E & FN. Institute for Environmental Assessment (1995). Guidelines for Baseline Ecological Assessment.

<sup>17</sup> Joint Nature Conservation Committee JNCC (2010). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit. JNCC, Peterborough

<sup>18</sup> Stace. C (1997). *A New flora of the British Isles*. Cambridge University Press, Cambridge

8.6.7 An area based on a 500m buffer round the turbines has been used as reference for discussion of habitat loss due to the wind farm infrastructure. That area is presented as a Phase 1 habitat survey map over which the infrastructure can be viewed. Standard Phase 1 survey codes are used.

8.6.8 Also included in the mapped area is ground within 100m of access tracks that are well outside the core turbine site. Additionally, some of the mapped area includes ground surveyed for earlier iterations of the wind farm design based on different turbine locations. This ground has been retained to give a better view of the continuity of habitats. Some marginal areas have been omitted that were not visited during the survey, either due to difficulty of access or to late changes in the turbine locations.

**National Vegetation Classification (NVC) Survey**

8.6.9 An NVC survey was undertaken which included identification of wetland habitats that might include Groundwater Dependent Terrestrial Ecosystems (GWDTes).

8.6.10 NVC community names are attached to each habitat polygon throughout the survey buffer round the wind farm infrastructure and a specific map is available that enables the infrastructure to be viewed overlying the NVC communities, with a buffer of 250m around deep excavations, such as borrow pits or turbine bases, and a buffer of 100m around shallow excavations, such as access tracks or temporary construction compounds.

8.6.11 The survey included consideration of GWDTes as outlined in Land Use Planning System SEPA Guidance Note 4 (LUPS GU4) and a discussion of likely impacts on these communities as a result of the development and ways in which these impacts could be mitigated. GWDTes are discussed later in Section 8.10.

8.6.12 The habitat surveys were carried out by Keith Watson of Starling Learning.

**Protected Species Surveys**

8.6.13 A number of surveys for protected species were carried out and the methodologies are described below.

**Bat Survey Methodology**

8.6.14 Surveys were based initially on the methodology recommended for onshore wind farms within the Bat Conservation Trust (BCT) Bat Surveys: Good Practice Guidelines 2016<sup>19</sup>, and in 2019 on Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation<sup>20</sup>, the DEFRA report Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management<sup>21</sup> and Eurobats - Guidelines for consideration of bats in wind farm projects<sup>22</sup>.

8.6.15 Field bat surveys aimed to gather information on:

- Location of roosts and swarming sites that may be affected by the development;
- The bat species assemblage using the site;
- Location and extent of commuting and foraging;
- The amount of bat activity on site and its spatial and temporal distribution; and
- Bat activity and the use of the site by bats.

8.6.16 This was achieved by a number of survey methods:

- Potential roost survey searches;
- Bat activity surveys following transects to assess use of the site. These included listening posts; and
- Remote bat surveys using static bat detectors.

8.6.17 A survey area with a minimum buffer of 200m rotor radius was assessed for roosting potential for bats prior to activity surveys using aerial photos followed by ground truthing. All potential roost sites including trees and buildings were plotted on a map and their proximity to the wind farm considered. All woodland areas within the survey area, and/or mature trees where applicable, were assessed for their potential to support roosting bats. This involved undertaking a field visual survey, using close focussing binoculars, from ground level to identify any potential features that may be of value to roosting bats. Buildings with potential for roosts were also checked. A description of these categories is provided in Table 8.2. Trees and buildings were classified with a view to carrying out emergence surveys on those with roost potential and likelihood of being affected by the development.

8.6.18 Table 8.2 is replicated from the BCT Guidelines 2016<sup>23</sup> and details factors to consider in determining survey effort and site risk.

**Table 8.2 – Guidelines for assessing the potential suitability of Proposed Development sites for bats, based on the presence of habitat features within the landscape**

Suitability	Description of Roosting Habitats	Description of Commuting and Foraging Habitats
Negligible potential	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low potential	A structure with one or more potential roost sites that could be used by bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or unvegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other similar habitat.  Suitable, but isolated habitat that could be used by small numbers of foraging bats such

<sup>19</sup> Hundt L. (2016) Bat surveys – Good Practice Guidelines (3<sup>rd</sup> Edition). Bat Conservation Trust, London.

<sup>20</sup> Bats and Onshore Wind Turbines: Survey, Assessment and Mitigation (2019). NatureScot, Natural England et al

<sup>21</sup> University of Exeter (2010). Understanding the Risk to European Protected Species (Bats) at Onshore Wind Turbine Sites to inform Risk Management. DEFRA

<sup>22</sup> Rodrigues L. et al (2014). Guidelines for consideration of bats in wind farm projects. Eurobats

<sup>23</sup> Hundt L. (2016) Bat surveys – Good Practice Guidelines (3<sup>rd</sup> Edition). Bat Conservation Trust, London. Table 4.1



	maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.	as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate potential	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back to gardens.  Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High Potential	A structure or a tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, protection, shelter conditions and surrounding habitat.	Continuous high quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broad-leaved woodland, tree lined watercourses, and grazed parkland. Site is close to and connected to known roosts.

- 8.6.19 There is low potential for roosting within the large survey area. The habitats are mainly either high, open moorland or conifer plantation, most of which is young, immature or recently felled. Those habitats have generally little or no potential for roosting bats. The only known roost, located at Finniegill, indicated to the survey team by the resident of the property.
- 8.6.20 The main foraging habitat is along the watercourses and forests (edges and canopy). There are other areas such as the lower-lying farmland (such as around the farms at Laverhay, Kirkhill and Leithenhall and the two habitations at Finniegill) and the Black Esk Reservoir where foraging habitat could be considered of better value for foraging bats. However, these are largely outside the development area and bats are unlikely to be affected.
- 8.6.21 Therefore, the suitability for bats was generally taken as **moderate potential**.
- 8.6.22 Table 8.3 details minimum survey standards recommended for onshore wind turbine development replicated from the BCT Guidelines 2016 and amended to include the 2019 guidance.

**Table 8.3 – Minimum Survey standards for bat surveys at proposed wind farm developments**

	Site Risk Level (taking into account factors detailed in Table 8.2)		
	Low risk	Medium risk	High Risk
<b>Roost surveys</b>			
<b>Selection of roosts requiring further survey</b>	If evidence of roosting by medium or high-risk species and/or roosts of district importance and above (see Table 8.2) is found, further survey should follow SNCO guidance and guidelines where possible		
<b>Activity surveys</b>			
<b>Survey area*</b>	Up to 200 m+ rotor radius from turbine locations or potential turbine locations		
<b>Ground level transect surveys</b>	One visit per transect each season (spring, summer and autumn)	One visit per transect each month (April-Oct)	Up to two visits per transect each month (April to October)
<b>Automated surveys at ground level 2016 Guidance</b>	5 consecutive nights for each single or pair of locations within the survey area, per season	5 consecutive nights for each single or pair of locations within the survey area, per month	Up to 2 sets of 5 consecutive nights for each single or pair of locations within the survey area, per month
<b>Automated surveys at ground level 2019 Guidance</b>	Minimum level of pre-application survey required using static detectors is 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October).		
<b>Automated surveys at height** 2016 Guidance</b>	For surveys undertaken from masts (met mast or other) survey effort is as outlined above for surveys at ground level.		
<b>Automated surveys at height** 2019 Guidance</b>	Should be considered for additional information if possible, especially if other surveys indicate regular activity at height, or if existing infrastructure allows or of a met mast is present.		

\*This should include potential turbine locations plus the nearest habitat features likely to be used by bats

\*\* Essential in addition to ground level surveys if keyholing

- 8.6.23 The site risk level for all survey locations was regarded as **MEDIUM** risk. The large survey area was divided up into sample areas based on habitat types as well as geographic coverage. The health and safety dangers to staff crossing difficult habitat in darkness, limited survey coverage to an extent, however the level of survey at each survey location is shown in Table 8.4 below.

**Table 8.4 – Transects and Remote Detectors for Bat Survey**

Location	Transects for activity surveys	No. of static detectors
Dundoran and Broadfield Height area	One transect per month	4
Laverhay Height area	One transect per month	4
Gillesbie area	One transect per month	4
Silton Forest area	One transect per month	6
Three Mullach Hill area	One transect per month	4
Rue Gill Hill and Black Hill area	One transect per month	4
South Loch Fell area	One transect per month	4

### Roost Surveys

- 8.6.24 The established roost at Finniegill was surveyed in spring and summer 2019. An emergence and re-entry survey was undertaken of the property by three surveyors surrounding the house, in such a way as to cover the likely roost features and watch the emergence exits and re-entry points reported by the resident, and in such a position as to watch an adjacent outbuilding.

### Automated surveys at ground level

- 8.6.25 The automated surveys involved the use of remote bat detectors Songmeter SM2BAT+ and AudioMoth. In 2018, these were placed in a variety of sites including forest edge and forest rides, and on moorland adjacent to turbine locations. A total of 30 remote detector locations were used. The static recorders were left in place for five consecutive nights each month to record all bat activity during that period, which was later analysed using either Analoop or Kaleidoscope Pro software.
- 8.6.26 The placement of the static detectors was adjusted to respond to changes to the wind farm layout or to supplement data as and when those became available. After initial surveys (and transects) were undertaken in the Dundoran and Broadfield Height area, the turbines in that area were withdrawn from the design. Consequently, the programme of survey was terminated for that area. Further changes were made to the turbine layout in later summer, with additional turbines being proposed in the South Loch Fell area. Static detectors were placed in that area in 2019 to give coverage of the months from June to August. Static detectors were also placed in the Three Mullach Hill area in 2019 to provide additional information concerning foraging by bats from the roost at Finniegill.
- 8.6.27 Additional supplementary information in the Dryfe Water area was collected in a one-off experimental use of AudioMoth recorders. These were placed at three locations along the Dryfe Water valley (beside the culverts at NY 17074 99840 (near Dryfehead Bothy) and NY 17321 97206 (near Finniegill road end) and at the trackside at Duncan's Cleuch.
- 8.6.28 The locations of the static bat detectors are detailed in Appendix 8.3 and shown on Figure 8.5.

### Automated surveys at height

- 8.6.29 At each site one of the recorders was mounted on a guyed post at a height of 3m in order to better record high flying bats. This took place at one location for each of the forestry sites surveyed.

### Walked transect surveys

- 8.6.30 Transect surveys to assess bat activity were carried out. The evening (commencing before sunset) or dawn (commencing before sunrise) surveys consisted of two surveyors walking each of the transect routes through the wind farm development area including visiting many of the turbine locations. The primary aim of these surveys was to add to the data collected by the automated surveys to establish the presence of any bats in the area and any key foraging areas or commuting routes. Given the large size of the site, the difficulty of covering the ground within the available time, and the weather constraints, some transects made use of the forestry access tracks for drive-round surveys. The routes are detailed in Appendix 8.1 and are shown on Figure 8.5.
- 8.6.31 All transect surveys were carried out between the months of April and October 2018 and undertaken in suitable weather conditions (i.e. avoiding heavy rain, heavy wind and dusk temperatures below 10°C) as far as possible. Dates, times and weather during the surveys are detailed in Appendix 8.2.

- 8.6.32 Evening surveys commenced at approximately 15 to 30 minutes before sunset and lasted for a minimum of two hours each night. Dawn surveys began at 1.5 hours before sunrise. The primary aim of the activity surveys was to log any potential roosts, foraging areas and any commuting routes. When a bat was detected during the survey, the time, species, activity (emerging, foraging or commuting) and direction of flight (where that could be seen) were recorded. Surveyors used Echo Meter Touch units connected to Apple iPads or Batbox Duet or Batbox Baton detectors connected to digital audio recorders (Zoom H2). Subsequent analysis of recordings was performed using Kaleidoscope Pro or Batscan software.

- 8.6.33 Surveyors stopped at regular listening posts along each route for five-minute periods to listen for bats. There was a minimum of ten listening posts on each transect.

- 8.6.34 Bat surveys and the placement and collection of static detectors were carried out by Jamie Manners, Alan Wood, Davy Galbraith, Liam Flynn, Diane Lyons, Liz Parsons, Dougie Irving, John Speirs, Karen McCaul and Seumas Harris of Starling Learning.

### Otters

- 8.6.35 The site was searched for any signs of otter, which included tracks, spraints, couches, lie ups, feeding remains and potential holts in accordance with guidance provided by Macdonald *et al* (1998)<sup>24</sup>.

- 8.6.36 Surveys were carried out on watercourses and ponds, with efforts focused on any features likely to be attractive for finding spraints and feeding remains. Prints were searched for in suitable substrates. Periods of heavy rainfall and high water levels were avoided for the surveys, to ensure that signs had not been washed away.

- 8.6.37 The site has a number of watercourses considered suitable for otters, including the Dryfe Water and its tributaries, including The Caple, Waterhead Burn, Finniegill Burn and Cocklaw Burn, and the Wamphray Water and its tributaries such as the Glengap Burn. Surveys continued up minor watercourses that feed the aforementioned waters and also included a survey buffer around watercourses that could be impacted by the potential main site access routes. The otter's main prey of fish and amphibia is present throughout the site (see fish survey data in Appendix 8.24).

- 8.6.38 The locations of any field signs were recorded using a handheld GPS device. Non-sensitive results are shown in Appendix 8.14 and on Figure 8.7. Details of holts and other protected structures are provided in the Confidential Annex.

- 8.6.39 Otter surveys were carried out by Joe Greenlees, Alan Wood, Liz Parsons, Diane Lyons, Jamie Manners, Liam Flynn and Davy Galbraith of Starling Learning.

### Water Vole

- 8.6.40 Water vole surveys were carried out in conjunction with the otter survey following the accepted methodology described in the Water Vole Conservation Handbook<sup>25</sup>. This involves searching for

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<sup>24</sup>McDonald et al. 1998. Proposals for future monitoring of British mammals. Department of the environment, Transport and the Regions, London.

characteristic signs of water vole presence, such as droppings, latrines, feeding stations, burrows, runways in vegetation and footprints.

- 8.6.41 Each watercourse was surveyed by two recorders; one in the water and one on the bank and any signs of water vole were recorded using a handheld GPS device.

### Badgers

- 8.6.42 The scoping survey noted widespread use of the site by badgers.
- 8.6.43 Surveys were carried out at each turbine location (and connecting habitat where possible to provide information on the ground over which likely access tracks would run) during winter months when vegetation is lower. Surveys were also conducted along the route of potential wind farm main site entrances and access tracks to help inform decisions on locating these features. Each location and up to 1 km from the site boundary, was searched for any signs of badger activity such as setts, either single isolated holes or a series of holes likely to be interconnected underground; faeces and latrines, scratching posts, usually at the base of trees; footprints, hairs, foraging and diggings signs and well-defined trails. Any evidence of badgers was recorded using a GPS device.
- 8.6.44 All setts identified were classified according to the widely used definitions shown in Appendix 8.4.
- 8.6.45 Badger surveys were carried out by Joe Greenlees, Liz Parsons, Diane Lyons, Alan Wood, Jamie Manners, Liam Flynn and Davy Galbraith in accordance with recommended guidelines<sup>26</sup>.

### Red Squirrel

- 8.6.46 Red squirrels are known to be common in the area (NBN Gateway and observations from scoping survey).
- 8.6.47 An assessment of the carrying capacity of red squirrels on site was carried out by means of a combination of transects for visual evidence and static monitoring in key locations utilising hair tubes and camera traps at feeding stations. The locations are given in Appendix 8.3.
- 8.6.48 Recommended guidance by Gurnell *et al* was used.<sup>27</sup>

### Pine Marten

- 8.6.49 Pine marten is known to be present in the area<sup>28</sup> which is recognised as an area experiencing active expansion in population. Pine martens were assessed using the recommended ten transects per hectare

(10x10km) technique (Cresswell *et al.*, 2012<sup>29</sup>). In addition, hair tubes and baited camera traps were used in the same locations as the red squirrel tubes.

### Brown Hare and Mountain Hare

- 8.6.50 Hares were not surveyed for specifically. There were many casual records of brown hares noted from other surveys and while the surveyors were driving through the site on the forestry access tracks. There were no sightings of Mountain Hare.

### Fish

- 8.6.51 The fish surveys were carried out to primarily assess the densities of juvenile salmonid species of fish present in the watercourses within the site. The salmonid species targeted are juvenile Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*). Although the fisheries surveys do not target non-salmonid species they are captured as a matter of course during these surveys. Other species typically found in watercourses within the Wamphray and Dryfe parts of the catchment include eel, stone loach, minnow, lamprey, stickleback and grayling. Of significance to any construction project, will be the presence of lamprey or eel due to their protected status.
- 8.6.52 The fish survey was undertaken using the methodology and record sheets developed by the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Tweed Foundation.
- 8.6.53 Electrofishing was employed, using backpack apparatus powered by a double 12v lead-acid battery with a variable voltage output. A smooth direct current was used at all sites. The backpack is linked to a cathode of braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.
- 8.6.54 The electrofishing uses semi-quantitative single pass methodology. A current is passed through the water, that temporarily modifies the fish's behaviour, resulting in the fish swimming towards the anode where it is intercepted by netting and placed in a holding container. The fish is anaesthetised using an approved anaesthetic and identified. Selected species are then measured and recorded.
- 8.6.55 Juvenile salmonids are measured to the nearest millimetre in order to enable age determination of individual fish into two basic categories. These categories are formally termed as '0+ fry', denoting young fish that have hatched in the same year as the survey, and '1++ parr', denoting young fish following their first winter.
- 8.6.56 After recovery, the fish is returned unharmed to the area from which it was captured.
- 8.6.57 An assessment is made at each site to grade the instream habitat for 1++ parr-stage salmonids into five categories: none, poor, moderate, good, or excellent. SFCC protocols were followed regarding the recording

<sup>25</sup> Strachan, R. and Moorhouse (2006/2011). *Water Vole Conservation Handbook*. English Nature, the Environment Agency & the Wildlife Conservation Research Unit, Oxford.

<sup>26</sup> Hutchison, I. (2009). *Scottish Badgers-Windfarms-Policy Statement*. Scottish Badgers; and Harris S., Cresswell P & Jefferies D. (1989). *Surveying Badgers*. Occasional Publication of the Mammal Society.No.9, Mammal Society Bristol.

<sup>27</sup> Gurnell J, Lurz P, McDonald R and Pepper H (2009) Practical Techniques for Surveying and Monitoring Squirrels. Practice Note. Forestry Commission, Edinburgh

<sup>28</sup> NatureScot Commissioned Report No. 740. Distribution of the pine Marten (*martes martes*) in Southern Scotland in 2013. <https://www.vwt.org.uk/wp-content/uploads/2015/04/croose-e-et-al-2014-distribution-of-the-pine-marten-in-southern-scotland-in-2013.pdf>

<sup>29</sup> Cresswell, W.J., Birks, J.D.S., Dean, M., Pacheco, M., Trehwella, W.J., Wells, D. & Wray, S. 2012. UK BAP Mammals: Interim Guidance for Survey Methodologies, Impact Assessment and Mitigation. Southampton, UK: The Mammal Society.

of percentage estimates of depths, substrate type and flow type. Also, percentage estimates were made of the quantity of bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation.

- 8.6.58 A total of 18 carefully-chosen sites were surveyed: eight sites along the Dryfe Water and associated tributaries, and the remaining ten along the Wamphray Water and its tributaries. The fish survey team worked its way over the length and width of the chosen area, systematically examining all watercourse with the selection.
- 8.6.59 Full details of the fish surveys are given in Appendix 8.17 and maps of the survey locations are provided in Figure 8.6.
- 8.6.60 The fish surveys were undertaken by T. Donnelly, A. Gillan and C. Stones, who are all River Annan District Salmon Fishery Board (RADSF) staff accredited by the SFCC.

**Reptiles**

- 8.6.61 All records of reptiles were recorded during ornithological and other surveys.

**Amphibians**

- 8.6.62 All records of amphibians were recorded during habitat, protected species and ornithological surveys.

**8.7 Ecological Impact Assessment (EclA)**

**General**

- 8.7.1 This EclA is carried out in accordance with the guidance set out in the Institute of Ecology and Environmental Management (IEEM) Guidelines for Ecological Impact Assessment (2006)<sup>30</sup> and Guidelines for Ecological Impact Assessment 2nd Edition (2016)<sup>31</sup>. This section defines the methodology used to assess the significance of effects through the process of an evaluation of the sensitivity (a combination of Nature Conservation Value and Conservation Status) and the magnitude of effect.
- 8.7.2 In order to accurately assess the potential impacts likely to occur from the development of the wind farm, the baseline conditions of the site need to be established which ecological features (habitats, species, ecosystems and their functions/processes) are likely to be affected by the proposal, both within and adjacent to the development area.
- 8.7.3 There are a wide range of criteria which will determine the sensitivity of each ecological feature. Examples include:

- Any site designations;

<sup>30</sup> CIEEM (2006) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute of Ecology and Environmental Management, Winchester

<sup>31</sup> CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

- Naturalness;
- Rarity of habitat, plant and animal species;
- Habitat diversity and connectivity;
- Habitats and species in decline; and
- Large populations or concentrations of species considered uncommon or declining in a larger context.

- 8.7.4 The Nature Conservation Value is defined on the basis of the geographic context given in Table 8.5 below, which follows the guidance detailed in CIEEM 2016<sup>31</sup>.

**Table 8.5 – Approach for Evaluating the Value or Sensitivity of Ecological Features in Scotland**

Sensitivity of Receptor	Examples (Guidance to evaluation)
International	An internationally designated site or candidate site (SPA, pSPA, SAC, pSAC, Ramsar site, Biogenetic Reserve). A viable area of a habitat type listed in Annex I of the Habitats Directive, EU 1992 or smaller areas of such habitat which are essential to maintain the viability of a larger whole. Any regularly occurring population of an internationally important species, which is threatened or rare in the UK, i.e. it is a UK Red Data Book species or listed as occurring in 15 or fewer 10 km <sup>2</sup> in the UK (categories 1 and 2 in the UK Biodiversity Action Plan (BAP)) or of uncertain conservation status or of global conservation concern in the UK BAP. A regularly occurring, nationally significant population/number of any internationally important species.
National (Scotland)	A nationally designated site (SSSI, ASSI, NNR, Marine Nature Reserve) or a discrete area, which the country conservation agency has determined meets the published selection criteria for national designation (e.g. SSSI selection guidelines) irrespective of whether or not it has yet been notified. A viable area of a priority habitat identified in the UK BAP, or of smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Any regularly occurring population of a nationally important species, which is threatened or rare in the region or county (see local BAP). A regularly occurring, regionally or county significant population/number of any nationally important species. A feature identified as of critical importance in the UK BAP.
Regional (Southwest Scotland)	Viable areas of key habitat identified in the Regional BAP or smaller areas of such habitat, which are essential to maintain the viability of a larger whole. Viable areas of key habitat identified as being of Regional value in the appropriate Natural Area profile. Any regularly occurring, locally significant population of a species listed as being nationally scarce which occurs in 16-100 10 km <sup>2</sup> in the UK or in a Regional BAP or relevant Natural Area on account of its regional rarity or localisation. A regularly occurring, locally significant number of a regionally important species. Sites, which exceed the County-level designations but fall short of SSSI selection guidelines, where these occur.
County (Dumfries and Galloway)	Semi-natural ancient woodland greater than 0.25 hectares (ha). County/Metropolitan sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, including



	Local Nature Reserves selected on County / metropolitan ecological criteria (County/Metropolitan sites will often have been identified in local plans). A viable area of habitat identified in LBAP. Any regularly occurring, locally significant population of a species which is listed in a County/Metropolitan “red data book” or BAP on account of its regional rarity or localisation. A regularly occurring, locally significant number of a County/Metropolitan important species.
District (Western Southern Uplands)	Semi-natural ancient woodland smaller than 0.25 ha. Areas of habitat identified in a sub-County (District/Borough) BAP or in the relevant Natural Area profile. District sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves selected on District/ Borough ecological criteria (District sites, where they exist, will often have been identified in local plans). Sites/features that are scarce within the District/Borough or which appreciably enrich the District/Borough habitat resource. A diverse and/ or ecologically valuable hedgerow network. A population of a species that is listed in a District/Borough BAP because of its rarity in the locality or in the relevant Natural Area profile because of its regional rarity or localisation. A regularly occurring, locally significant number of a District / Borough important species during a critical phase of its life cycle.
Local	Areas of habitat considered to appreciably enrich the habitat resource within the context of the Parish or neighbourhood, e.g. species rich hedgerows. A regularly occurring but low number of locally common protected species within or adjacent to the Development area. Local Nature Reserves selected on Parish ecological criteria.
Very local	Areas of habitat that have a limited ecological value. Plant assemblages tend to be species-poor but may be utilised by a small number of faunal species. Those habitats that have an effect of enriching and complimenting the local natural environment to a small degree.
Negligible	Areas of habitats considered to be of very limited ecological value. They are not representative of natural habitats and are very species poor. Those habitats that do not enrich the local natural environment.

- 8.7.5 Those ecological features identified to be potentially affected by the development and deemed to be of local importance or above, are termed ‘Important Ecological Features’ (IEFs).
- 8.7.6 Designated sites can be readily assigned to an appropriate level. For example, a site with a designation assigned through European legislation, such as a Special Protected Area (SPA) or a Special Area of Conservation (SAC), would be considered of International significance, a SSSI designated by UK statute would be of National significance and a site designated by a Local Authority would be of District importance. Where a feature has value at more than one level, its overriding value is that of the highest level. However, some sites may be designated for different features at the European and National levels, so these features should be valued accordingly.
- 8.7.7 The assignment of undesignated features, such as Biodiversity Action Plan (BAP) habitats and species, or areas of ancient woodland, may not fall clearly into the designations as described above. Therefore, a

number of other criteria are used to assess the nature conservation value of a defined area of land. Accepted criteria are set out in ‘A Nature Conservation Review’ (Ratcliffe, 1977)<sup>32</sup>, and include diversity, rarity, naturalness, intrinsic appeal, typicalness and recorded history.

- 8.7.8 Features, which have no ecological value in themselves, may still be regarded as important if they serve an ecological function, such as acting as a buffer against negative effects, or enabling the effective conservation of a more valuable area. This also applies to features, which aid the dispersal, migration and genetic transfer of species such as rivers, small woods, ponds, hedgerows and field boundaries.
- 8.7.9 Impacts may be defined as direct (e.g. direct habitat loss or destruction of an otter holt) or indirect (e.g. disturbance during construction or change in habitat suitability due to run off or impeded drainage).
- 8.7.10 The IEEM guidelines set out the process for assessment in the following stages:
- Description of the ecological baseline i.e. results of fieldwork and desktop study;
  - Identification of IEFs, i.e. the species of ecological value within the zone of influence;
  - Determination of the nature conservation value of the IEFs;
  - Identification of the potential impacts due to construction, operation and decommissioning of the development on the IEFs;
  - Determination of the magnitude of impact on the IEFs taking into account the sensitivity of the receptor and the duration and reversibility of the impact;
  - Determination of the significance of the impact based on the interaction between the magnitude/duration, the nature conservation value and the likelihood of the impact occurring;
  - Identification of mitigation measures to reduce or avoid negative impacts;
  - Determination of the residual impact following mitigation; and
  - Identification of any monitoring requirements.

**Magnitude of Effect**

- 8.7.11 The magnitude of effect refers to the level of changes in the extent and integrity of the ecological feature. A definition of ecological integrity is given within the Scottish Executive Circular 6/1995 (2000)<sup>33</sup> stating, “*The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*”. Although this applies specifically to European designated sites such as SACs, it is applied to wider countryside habitats for the purpose of this assessment.
- 8.7.12 Determining the magnitude of any likely effects requires an understanding of how the ecological feature will respond to development during and after construction. The effects can be adverse, neutral or beneficial.
- 8.7.13 Effects on IEFs can be judged in terms of magnitude in space and time. Magnitude refers to the scale of the impact. This may relate to the loss of a breeding population or the displacement of an individual species.

<sup>32</sup> Ratcliffe, D. 1977. *A Conservation Review*. Cambridge University Press.

<sup>33</sup> Scottish Executive (2000). Nature Conservation: implementation in Scotland of EC Directives on the conservation of natural habitats and of wild flora and fauna and the conservation of wild birds (The Habitats and birds Directives). Revised guidance updating Scottish Office Circular no. 6/1995. Accessed via: <http://www.scotland.gov.uk/library3/nature/habd-00.asp>

- 8.7.14 Magnitude is assessed at five levels for spatial effects as shown in Table 8.6.
- 8.7.15 Magnitude is also assessed at five levels for temporal effects, as shown in Table 8.7. Duration is defined as the time for which the impact is expected to last before recovery.

**Table 8.6 – Definition of spatial effect magnitude on IEFs**

Negative Effect Magnitude	Description
Very high	Total or almost complete loss of the receptor. Loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether. The conservation status of the receptor would be affected Guide: <20% of population remains
High	Result in large scale, permanent changes in the receptor and likely to change its ecological integrity. These effects are likely to result in overall changes in the conservation status of a receptor. Guide: 20-80% of population lost
Medium	Include moderate scale, long-term changes in a receptor or larger scale temporary changes, but the integrity of the receptor is unlikely to be affected. This may mean that there are temporary changes in the conservation status of the receptor, but these are reversible and unlikely to be permanent. Guide: 5-20% of population lost
Low	Include effects that are small in magnitude, have small-scale temporary changes, and where integrity is not affected. These effects are unlikely to result in overall changes to the conservation status of a receptor. Guide: 1-5% of population lost
Negligible	No perceptible change in the ecological receptor. Guide: 1% of population lost

**Table 8.7 – Definition of temporal effect magnitude on IEFs**

Duration	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as above 26 years) except where there is likely to be substantial improvement after this period.
Long term	Between 15 and up to (and including) 25 years.
Medium term	Between 5 and up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.
Negligible	No effect.

**Determining Significance of Potential Effects**

- 8.7.16 The significance of potential effects is determined by considering the value of the receptor and the magnitude of the effect and using professional judgement as to whether the integrity of the receptor will be affected.

- 8.7.17 Effects are more likely to be considered significant where they affect species of a high conservation value or where the magnitude of the effect is high. Effects considered not significant would apply to situations where the receptor is of a low conservation value, the integrity is not threatened, or the magnitude is low.
- 8.7.18 In accordance with the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant. The significance levels of effect on habitats and species are described in Table 8.8. Effects resulting in detectable changes in the conservation status of regional populations of Nature Conservation Importance are automatically considered to be significant effects for the purposes of the EIA Regulations (i.e. no distinction is made between effects of “major” or “moderate” significance). Non-significant effects include all those which are likely to result in small to barely detectable (minor) or non-detectable (negligible) changes in conservation status of regional (and therefore national) populations.

**Table 8.8 Significance Levels of Effects on Habitats and Species**

Significance Level of Effect	Description
Major	Detectable changes in regional populations of Nature Conservation Importance that would have a severe impact on conservation status.
Moderate	Detectable changes in regional populations of Nature Conservation Importance that would likely have an impact on their conservation status.
Minor	Small or barely discernible changes that would be unlikely to have an impact on the conservation status of regional populations of Nature Conservation Importance.
Negligible	No or non-detectable changes in the conservation status of regional populations of Nature Conservation Importance.

**Frequency and Timing**

- 8.7.19 The number of times an activity occurs will have an impact on ecological features. The timing too is significant if the activity takes place during a critical period e.g. when birds are nesting.

**Reversibility**

- 8.7.20 An irreversible effect is one from which recovery is not possible within a reasonable timescale or if there is no possibility of action being taken to repair it. A reversible effect is one where recovery can take place or can be reversed by mitigation.

**Assessment of Cumulative Impacts and Effects**

- 8.7.21 NatureScot (2012) Cumulative Assessment is used to inform the cumulative assessment, and the assessment of effects for surrounding developments will be taken into consideration as part of this.

### Assessment of residual impacts

- 8.7.22 If a potential impact is determined to be significant, mitigation measures to avoid, reduce or prevent the impact are suggested wherever possible. Remaining residual impacts will then be discussed.
- 8.7.23 In order to test whether or not an impact will affect the integrity of a site or ecosystem and thereby significant, it is necessary to understand whether the changes arising from the Proposed Development are likely to move the baseline conditions at the site or ecosystem closer to, or further from the condition, which constitutes 'integrity' for that system.

### Baseline Conditions

- 8.7.24 The proposed Scoop Hill Community Wind Farm site lies within the Southern Uplands, situated to the south of the town of Moffat, forming a mostly upland block of land between Eskdalemuir and Newton Wamphray, extending south towards Boreland.
- 8.7.25 The upland landscape is characterised by a series of ridges (and some smaller lower ridges) of hills that run broadly from north to south. The hills are higher in the north of the site, where Scaw'd Fell in the west is 549m, and Dun Moss is 541m, in the east. The hills descend to around 250m in the lowest part of the site.
- 8.7.26 There is considerable local relief in some of the valleys between the hills where steep slopes can descend to the watercourses. The main rivers, or burns, are the Wamphray Water, in the west of the site, and the Dryfe Water, in the east.
- 8.7.27 Much of the eastern and central area is covered by dense coniferous plantation (some large areas have been recently felled, and several of those replanted), but most of the western half supports a range of typical open upland habitats and vegetation, used for grazing of both cattle and sheep.
- 8.7.28 A total of 75 turbines is proposed, 34 of which will be positioned on open ground and the remaining 41 will be located within the plantation areas. There are two potential site access entrances. One starts far to the west of the site on the B7076 between Mid Murthat Farm in the north and Cogrie Farm to the south. The track will cross through the former Nether Murthat Quarry and over the River Annan. From there it will continue north-west, across Poldean Farm's pastures, rising until the lower slopes of the westernmost ridge of wind turbines. The second proposed track starts from the minor road to the south of the site, close to the property of Windshields. It follows an existing agricultural track for most of the way until joining the turbine site.
- 8.7.29 The Zone of Influence (ZOI) is identified as the area and resources that may be influenced by the development. It includes a radius around turbines, ancillary structures, borrow pits and access tracks of 500m for the Phase 1 habitat survey, 250m radius for NVC survey and assessment of GWDTEs, and 100m for protected species.

## 8.8 Desk Study

### Natural Heritage Zone

- 8.8.1 Natural Heritage Zones (NHZ) are a system devised by NatureScot. It of comprises sub-divisions of Scotland based on wildlife, natural features, landforms, geology, land use and human impact. The proposed Scoop Hill Wind Farm is within the Western Southern Uplands NHZ and is adjacent to the Border Hills NHZ.

### Designated Sites

- 8.8.2 Part of the Dryfe Water SSSI (also listed in the Ancient Woodland Inventory (AWI) lies near two of the southernmost turbines. The Dryfe Water runs the length of the entire eastern section of the proposed wind farm. Possible impact on the Dryfe Water SSSI will be considered within the impact assessment.
- 8.8.3 As the other designated sites are too distant from the development, they will not be considered further within this EclA.
- 8.8.4 Information was obtained from the AWI regarding the locations of significant woodland areas close to the development. There are a great many small sites, totalling 700, comprising both ancient woodlands and long-established woodlands, within a 20km radius of the proposed wind farm. Some are close to the margins of the 500m turbine buffer zone, or within the developable site. These include the riparian woodlands along the Wamphray Water west of Laverhay and Milne (Milne Wood). At the southern end of the Dundoran Plantation there is Long Wood and Whinny Plantation (Long-Established (of plantation origin)) is close to the proposed site entrance on the Old Carlisle Road. Another un-named woodland lies very close to the eastern access track for the site, on the lower slopes of Rangecastle Hill in the southern part of the site. Several of those woodlands are now conifer plantations. Apart from the woodlands along the Wamphray Water and Dryfe Water corridors, there is no potential for impact on any of the woodland sites. A representative sample of these sites is provided in Appendix 8.6.
- 8.8.5 The Laverhay Forest, Rue Gill Forest and Silton Forest are within the Eskdalemuir Red Squirrel Priority Woodland and are within an area designated as a 'Stronghold Forest' for red squirrel conservation<sup>34</sup>.
- 8.8.6 The majority of the non-statutory sites are not within the same hydrological unit as the development and therefore cannot be directly impacted by any difference in the amount of drainage waters or any extra siltation resulting from it and therefore, they will not be considered further within this EclA.

### Habitat and Species Records

- 8.8.7 Records of protected plants and plants on the LBAP lists and protected species provided through consultation are provided in Appendix 8.7.
- 8.8.8 Blanket bogs, upland heaths, marshes, upland springs and flushes, purple moor grass and rush pastures, acid grasslands, and native ash woods are all Dumfries and Galloway LBAP habitats.
- 8.8.9 The lichens Lungwort *Lobaria pulmonaria*, *Parmeliella triptophylla*, *Sticta fuliginosa*, *S. limbata*, *S. sylvatica* and *Nephroma laevigatum* are known to occur in the Dryfe Water valley. With the exception of *Nephroma laevigatum*, those are priority species in Dumfries and Galloway LBAP. All these species are on the Scottish Biodiversity List (SBL).
- 8.8.10 SWSEIC supplied a record for Juniper *Juniperus communis*, at Outer Mid Hill in the eastern forested area of the wind farm site.

<sup>34</sup> Scottish Squirrel Group.2011. Scottish Strategy for Red Squirrel Conservation

- 8.8.11 Red squirrels are found in the various forests directly adjacent to the site and from the main forested block in the eastern part of the wind farm site, within the Eskdalemuir Red Squirrel Priority Woodlands area. Grey squirrel have been recorded in the Siltan Forest.
- 8.8.12 Otters have been recorded in many of the watercourses in the area including the Dryfe, the Black Esk, Birny Gill and the River Annan.
- 8.8.13 No water voles have been recorded within the development area.
- 8.8.14 Badgers have been recorded at a number of locations within the forests.
- 8.8.15 SWSEIC provided records for Common Pipistrelle *Pipistrellus pipistrellus* and for a pipistrelle roost from the vicinity of the Black Esk, just to the east of the site. A pipistrelle roost has also been known for many years at Finniegill.
- 8.8.16 Red Deer *Cervus elaphus*, Sika Deer *Cervus nippon* and Roe Deer *Capreolus capreolus* have also been recorded in the area.
- 8.8.17 Common Lizard *Zootoca vivipara* and Slow-worm *Anguis fragilis* have been recorded within the site, at Gallatae and near Dryfehead respectively.
- 8.8.18 Common Toad *Bufo bufo* and Common Frog *Rana temporaria* have also been recorded within the site.
- 8.8.19 Desk-top records from SWSEIC show the presence of Atlantic Salmon *Salmo salar*, Brown/Sea Trout *Salmo trutta* and European Eel *Anguilla anguilla* in the Black Esk just to the east of the developable site.
- 8.8.20 SWSEIC provided records of Small Pearl-bordered Fritillary *Boloria selene* and Small Heath Butterfly *Coenonympha pamphylus* which have been recorded in the area.

## 8.9 Phase 1 Habitats and NVC communities (Site Survey)

- 8.9.1 The following habitats were recorded during the Phase 1 Habitat survey. Some are too small to map and are given as Target Notes in Appendix 8.9. Plant species lists are provided in Appendix 8.10. Comments are made below on these small areas of habitat and the main habitats which are described in Sections 8.9.3 to 8.9.52:

- B1.1 Unimproved acid grassland (B Grassland and marsh);
- B1.2 Semi-improved acid grassland (B Grassland and marsh);
- B2.1 Unimproved neutral grassland (B Grassland and marsh);
- B2.2 Semi-improved neutral grassland (B Grassland and marsh);
- B4 Improved grassland (B Grassland and marsh);
- B5 Marsh/marshy grassland (B Grassland and marsh);
- B6 Poor semi-improved grassland (B Grassland and marsh);
- D1.1 Acid dry dwarf shrub heath (D Heathland);
- D2 Wet dwarf shrub heath (D Heathland);
- D5 Dry heath/acid grassland mosaic (D Heathland);
- D6 Wet heath/acid grassland mosaic (D Heathland);
- E1.6.1 Blanket bog (E Mire);
- E1.7 Wet modified bog (E Mire);

- E1.8 Dry modified bog (E Mire);
- E2.1 Acid/neutral flush (E Mire);
- G1 Standing water (G Open water);
- G2 Running water (G Open water);
- A1.1.1 Semi-natural broad-leaved woodland (A Woodland and scrub);
- A1.1.2 Broad-leaved plantation woodland (A Woodland and scrub);
- A1.2.2 Coniferous plantation (A Woodland and scrub);
- A.1.3.2 Mixed plantation (A Woodland and scrub);
- A2.1 Scrub (A Woodland and scrub);
- A4.2 Recently-felled coniferous woodland (A Woodland and scrub);
- C1.1 Continuous bracken (C Tall herb and fern);
- C3.1 Tall ruderal (C Tall herb and fern);
- C3.2 Non-ruderal (Tall herb and fern);
- I1.1.1 Natural acid/neutral inland cliff (I Rock exposure and waste);
- I1.2.1 Natural acid/neutral scree (I Rock exposure and waste);
- I2.1 Quarry (I Rock exposure and waste);
- J1.2 Amenity grassland (J Miscellaneous);
- J4 Bare ground (J Miscellaneous).

- 8.9.2 The main Phase 1 habitats found during the survey are discussed in broad groupings in the following sections and are shown on Figure 8.2 and the target notes on Figures 8.3a to 8.3k.

### Grasslands and related open habitats

- 8.9.3 Much of the study area is comprised of grassland and the most commonly occurring type, by far, is **B1.1 Unimproved acid grassland (B1.1)**. This covers a large proportion of the ground on steeper hillsides and also some hilltop ridges where the soils are shallow, or on well-drained and heavily grazed peats. Acid grassland is the largest of all the open habitat types (including heaths and mires) within the surveyed area, measuring around 892 ha.
- 8.9.4 Much of it is composed of a relatively small pool of species: several grasses, a very limited number of herbs and sedges, and a few mosses. Minor changes in dominants drawn from this pool are used to code different sections of the grassland to NVC community or sub-community level.
- 8.9.5 At higher altitudes, on poorly draining peat soils of varying depth, the grassland is often characterised by the high frequency of Heath Rush *Juncus squarrosus* (NVC U6). Associates include a limited range of common acid grassland species such as Wavy Hair-grass *Deschampsia flexuosa*, Mat-grass *Nardus stricta*, Brown Bent *Agrostis vinealis*, Sweet Vernal-grass *Anthoxanthum odoratum*, Heath Bedstraw *Galium saxatile*, Tormentil *Potentilla erecta* and mosses including *Pleurozium schreberi*, *Rhytidiadelphus squarrosus* and *Polytrichum commune*.
- 8.9.6 Where wetter, usually close to bog vegetation and often in mosaic with it, the vegetation is preferable to the wetter, more acidic NVC U6a sub-community, marked by scattered relic Hare's-tail Cottongrass *Eriophorum vaginatum* tussocks and bog-mosses such as *Sphagnum rubellum* and *S. fallax*.
- 8.9.7 Acid grassland marked by an increase in Mat-grass *Nardus stricta* (NVC U5) is widespread and usually occurs on steeper slopes or shallower ridges, often intimately with the NVC U6 community, or emerging on ridges through degraded blanket mire. However, apart from the change in species prominence, the associated



species complement is very similar to that of the grassier sub-community of NVC U6, and often much of the vegetation is intermediate between the two. Typically, the U6 occurs on higher and level ground, usually more intimately associated with the blanket mire precursor.

- 8.9.8 The steeper lower slopes and steeper burn sides, where the grasslands are less peat-influenced and usually (but not always) better draining, support bent-fescue grassland (NVC U4). Those grasslands share many species of the more acid types but typically have more broad-leaved grasses such as Common Bent *Agrostis capillaris*, Spreading Meadow-grass *Poa humilis* and Sweet Vernal-grass *Anthoxanthum odoratum* along with Heath Bedstraw, Tormentil and Common Sorrel *Rumex acetosa*. Mosses such as (often dense) *Rhytidiadelphus squarrosus* and *Pseudoscleropodium purum* are usually present in addition to more acidophilous species noted above.
- 8.9.9 At some higher elevations and on steep slopes the grassland can be more acidic, with much Wavy Hair-grass and Blaeberry *Vaccinium myrtillus* (NVC U4e). At the lower and more accessible fringes the U4 bent-fescue grasslands are short-grazed and more enriched (NVC U4b) and it can be distinctly improved on the western margins of the survey area (NVC MG6).
- 8.9.10 Unimproved neutral grassland (NVC MG5) appears to be rare although some has been noted along the larger watercourse margins (e.g. Dryfe Water). Additionally, a few poorly-draining pastures have been recorded (NVC MG9 or MG10) with either Tufted Hair-grass *Deschampsia cespitosa* or Yorkshire-fog *Holcus lanatus* respectively predominating. Strips of those types of vegetation also occur in the disturbed margins of forestry access tracks.
- 8.9.11 **Unimproved neutral grassland, B2.1**, accounts for 12.8ha of ground within the study area.
- 8.9.12 A large proportion of acid pasture has been mapped as **B1.2 semi-improved acid grassland**, referable to the NVC U4b sub-community. That category accounts for just under 262ha of the study area.
- 8.9.13 Agriculturally improved kinds of grassland (**B4 Improved grassland, B6 Poor semi-improved grassland and B2.2 Semi-improved neutral grassland**) are well-represented in farmland at the lower elevations of the site.
- 8.9.14 No obvious large-scale calcareous grassland (NVC CG10) was recorded but a few more enriched areas do occur, often where flushed locally along steeper sides of watercourses, or steep hillsides. Indicator species, where drier, include Wild Thyme *Thymus polytrichus*, Dog-violet *Viola riviniana*, Spring Sedge *Carex caryophyllea* and Mouse-ear Hawkweed *Hieracium pilosella*. Where conditions are wetter, species such as Glaucous Sedge *Carex flacca*, Quaking-grass *Briza media* and Hairy Oat-grass *Avenula pubescens* are found.
- 8.9.15 Other open communities are limited. Small patches of Greater Woodrush *Luzula sylvatica* were recorded in several places (NVC U16) and there were a few scattered patches with Lemon-scented Fern *Oreopteris limbosperma* (NVC U19), referable to **C3.1 Tall ruderal herb and fern**. There are some stands of Nettle *Urtica dioica* and Creeping Thistle *Cirsium arvense* (NVC OV25) and of Rosebay Willowherb *Chamerion angustifolium* (NVC OV27) around plantation areas, representing the Phase 1 habitat **C3.2 Non-ruderal tall herb and fern**.
- 8.9.16 Those two habitats account for very small amounts of ground within the study area, 0.5ha and 0.04ha, respectively.

### Dry and Wet Dwarf Shrub Heaths

- 8.9.17 Areas of wet and dry acid dwarf shrub heath occur across the site, although they tend only to be significant in the far north, where grazing pressure is lower. **D1.1 Dry acid heath** occupies 302.7ha of the study area and is dominated by Heather *Calluna vulgaris*, usually with subordinate Blaeberry and hypnoid mosses but few other associates at any frequency (NVC H12). A few small areas at higher altitude supported more Blaeberry (NVC H18) and at a few rock outcrops (e.g. Glengap) Bell Heather *Erica cinerea* can be well represented (NVC H10). As noted below, under '**Mire and other wetland vegetation**', the transitions from Heather-dominated dry heath to drier blanket bog is frequently obscure, with a fairly uniform cover of shrubby Heather forming a monotonous canopy and with only subtle changes in associate species (and shallower peat) indicating a change.
- 8.9.18 **D2 Wet heath** (NVC M15) is scattered and usually associated with bog margins, or degraded bog relics, where typical bog indicators (e.g. Hare's-tail Cotton-grass *Eriophorum vaginatum*) are absent. Heather can be frequent, but it is often the presence of species such as Purple Moor-grass *Molinia caerulea* or Deer-grass *Trichophorum germanicum* that indicate wet heath conditions. Associates include elements of bog and drier heath, or acid grassland, vegetation, and peat depth is typically shallow, but retaining some moisture. Purple Moor-grass can dominate some slopes (e.g. in the north-east above the upper stretches of the Dryfe Water, but only locally in the extreme south-west) and can be somewhat intermediate to Purple Moor-grass dominated mire (NVC M25). However, where heath and acid grassland indicators occur, notably Blaeberry and Deer-grass, the NVC M15 code (sometimes NVC M15d) has been applied.
- 8.9.19 **D2 Wet heath** accounts for just over 150ha of the survey area.
- 8.9.20 At some boggy depressions, the wet heath has strong affinities to degraded blanket bog vegetation (NVC M17) and some areas are coded as intermediate where Hare's-tail Cotton-grass is scarce or absent, but bog-mosses are quite well represented, along with species such as Bog Asphodel *Narthecium ossifragum*.
- 8.9.21 At several locations there are areas that have patchworks of dry heath and acid grassland or wet heath with acid grassland and these have been mapped respectively as **D5 Dry dwarf shrub heath/acid grassland mosaic**, or **D6 Wet dwarf shrub heath/acid grassland mosaic**.
- 8.9.22 The D5 and D6 mosaics make up 51.2ha and 32.8ha of the mapped area, respectively.

### Mires and other wetland habitats

- 8.9.23 Bog vegetation is a common feature along most of the higher level summit ridges, although, apart from in the extreme north, much of the bog has been the subject of many years of heavy draining and continuous grazing. That has resulted in a more degraded, grassy (graminoid) bog vegetation cover. At this location, domination by Hare's-tail Cotton-grass is a defining feature of the grazed bogs (NVC M20) and extending down the upper slopes, where there is usually increasing elements of acid grassland, notably grasses and hypnoid mosses.
- 8.9.24 Although the bog vegetation is mostly graminoid, there are usually some ericoids present, such as Heather, Crossed-leaved Heath *Erica tetralix*, Blaeberry and Crowberry *Empetrum nigrum*. Bog-mosses can be well represented, along with hypnoid mosses (notably *Pleurozium schreberi*) and there may be tight tussocks of Haircap Moss *Polytrichum strictum*. In this case, the vegetation is better referred to as the NVC M20b sub-community or even NVC M19 blanket bog. The latter is more distinctive when Heather is more widespread and taller, although still with the cotton-grass, and bog-mosses can be common but often these are limited

- and hypnoid mosses are prevalent (notably *Pleurozium schreberi* and to a lesser extent *Rhytidiadelphus squarrosus*). A feature of higher elevation bogs is the presence of Cowberry *Vaccinium vitis-idaea* and Cloudberry *Rubus chamaemorus*.
- 8.9.25 The Heather-dominated blanket bog, extensively represented in the two northern extensions, can be somewhat monotonous with a low diversity domination by shrubby Heather and limited bog-mosses and hypnoid mosses common, such as *Pleurozium schreberi* and *Hypnum jutlandicum*. This habitat is mapped as **E1.8 Dry modified bog**. The vegetation grades often imperceptibly to dry heath (NVC H12) on shallowing (but still quite deep) dry peat. Separation between NVC M19 and H12 then becomes somewhat arbitrary and extensive areas have been coded with both types (H12-M19 or M19-H12). More typical NVC H12 dry heath usually occurs on the steeper mineral soils below. The best quality bogs can contain several wet hollows and bog pools (**E1.6.1 Blanket bog**). Those features are rather limited at this site but where they occur, they contain some vegetation referable to the wet raised mire NVC M18 with *Sphagnum magellanicum*, and extensive *Sphagnum* lawns (mostly *Sphagnum fallax*, but also *S. cuspidatum* and *S. papillosum*) usually accompanied by cotton-grasses (*Eriophorum spp*), referable to NVC M2.
- 8.9.26 There are several lower altitude bogs, mainly in the south, occurring on level ground usually around watercourse margins or headwaters, such as at the Sembletree Burn that feeds The Caple, notably at Cadwell Moss. There are further relics of this habitat at Peat Hill and Loftshaws, and in the plantation glades along the Murthat and Cocklaw Burns. These bogs share core bog elements noted above but usually with species such as Deer-grass and Bog Asphodel and the bog-moss cover is usually more extensive, often with much *Sphagnum fallax*, *S. papillosum* and *Aulacomium palustre* can be locally frequent and there can be other bog-mosses and some liverworts. These bogs are best classified as NVC M17 blanket bog, although a few wetter hollows are closer to the raised bog community, NVC M18. Where the bogs are heavily-drained (which occurs at many areas), the vegetation is more modified (NVC M17c) and some of those grade into, or are intermediate with, wet heath on shallowing peat (NVC M15).
- 8.9.27 **E1.6.1 Blanket bog** occupies roughly 89.5ha of the survey area.
- 8.9.28 In **E1.7 Wet modified bog**, Hare’s-tail Cotton-grass can be frequent but Purple Moor-grass *Molinia caerulea* generally forms a significant proportion of the vegetation (NVC M25). This is a common habitat around blanket bog margins, where it occurs on deep peats and with other bog species as associates. Such areas are well represented (often along ride margins) on deep peats in the plantation zone and can show up quite distinctly as pale patches and strips on aerial images. The Purple Moor-grass vegetation is often rather monotonous and tussocky but, rarely, where there is some mineral flushing on shallower peat, associate species diversity can be higher (NVC M25c – see below **B5 Marshy grassland**).
- 8.9.29 **E1.7 Wet modified bog** accounts for around 31.7ha of the area surveyed. **E1.8 Dry modified bog** accounts for a much larger area, roughly 312.6ha.
- 8.9.30 Other mire vegetation is widespread and often forms extensive stands along broad valleys and to the margins of watercourses, and many are fed by drainage (both natural and artificial) from the blanket mires along the summit ridges. Where associated with bogs, as in shallow erosion gullies or broader drains, there can be luxurious *Sphagnum* ‘lawn’ vegetation, with thick mats of bog-moss (mostly *S. fallax* but also *S. cuspidatum* and *S. papillosum*) usually with cotton-grasses *Eriophorum spp*. (NVC M2). This type of vegetation often grades, with increasing water movement (**E2.1 Acid/neutral flush**), to sedge mire (NVC M6) where Common Sedge and Star Sedge *Carex echinata* occur. Very often these mires are dominated by Soft Rush *Juncus effusus* (NVC M6c) or Sharp-flowered Rush *Juncus acutiflorus* (NVC M6d). All share *S. fallax* as extensive ground cover. The rush-dominated types of vegetation usually swiftly grade to more mineral-enriched rush-pastures (NVC M23) as noted below.
- 8.9.31 In most cases the more distinctly minerotrophic flushes or marshes are dominated by rushes (Soft Rush or Sharp-flowered Rush) and are widespread along the lower hillsides and along watercourse margins. The largest zones, usually flushed, are dominated by Sharp-flowered Rush and associates typically include Marsh Thistle, Marsh Bedstraw *Galium palustre*, Meadow Buttercup *Ranunculus acris*, Marsh Violet *Viola palustris*, Cuckooflower *Cardamine pratensis*, grasses such as Yorkshire-fog and Tufted Hair-grass and, typically, the moss *Calliergonella cuspidata*. Soft Rush mire (NVC M23b) is also widespread as it is more often associated with drains and watercourse feeders, often where the water is more stagnant. Small patches of soft Rush are a frequent feature of poorly draining hillsides and ridges otherwise dominated by short-grazed acid grassland, although here they are typically relatively dry and lack a number of typical marsh elements.
- 8.9.32 There are several areas where the species diversity of rush pastures can be quite high, presumably reflecting reduced grazing pressure but also more base-rich flushing: indicators can include Bugle *Ajuga reptans*, Yellow Pimpernel *Lysimachia nemorum*, Opposite-leaved Golden-saxifrage *Chrysosplenium oppositifolium*, Devil’s-bit Scabious *Succisa pratensis*, Marsh Hawk’s-beard *Crepis paludosa*, and more locally, Marsh Valerian *Valeriana dioica*, Smooth-stalked Sedge *Carex laevigata*, and rarely, Slender Sedge *Carex lasiocarpa*. The latter occurs at mires along small watercourses in the plantation zone. Also, here, due to the lack of grazing, Meadowsweet *Filipendula ulmaria* can become dominant as opposed to Sharp-flowered Rush (NVC M27), but species diversity is usually similar.
- 8.9.33 The rush-pastures are mapped as **B5 Marshy grassland**.
- 8.9.34 Other small mires, flushes and springs occur, scattered across the site, usually with short sedges and mosses (NVC M6 and, rarely, NVC M10). There are also a few very small flushes with much *Palustriella commutata* (NVC M37). The latter were recorded on the lower slopes of Loft Hill and Peat Hill, above the Dryfe Water, and on the western slopes of Heatherybrae Head, Howgill Fell and Criffel. The NVC M37 springs, referable to **E2.3 Bryophyte-dominated spring**, are too small to map and their locations are noted by target notes.
- 8.9.35 Only a small area of these wetlands, 0.5ha, has been mapped as **E2.1 Acid/neutral flush** habitat in the survey area. Areas mapped as **B5 Marshy grassland** occupy a much larger 39ha.
- 8.9.36 **F1 Swamp** is rare in the study area and accounts for only 0.2ha of the mapped area. Only small patches were found, sometimes associated with ponds, in the lower-lying agricultural areas such as near the start of the proposed western access track near Cogie. That swamp is typical of NVC S9a *Carex rostrata* swamp, dominated by Bottle Sedge *Carex rostrata*. The drier margins have patchy Reed Canary-grass *Phalaris arundinacea* and rush mire (NVC S28 and NVC 23).
- 8.9.37 The large Black Esk Reservoir lies around 500m to the east of the site and is hydrologically unconnected. However, within the construction site **G1 Standing water** is scarce and is generally man-made, such as farmland ponds. There is a small pond beside the existing forestry access track in the Silton Forest that is likely to have been excavated as a duck-shooting pond. A much larger waterbody is the lagoon in an area that is proposed to contain part of the far western access track into the site. It is situated beside the River Annan and is a relic of the former Nether Murthat sand and gravel quarry. **G1 Standing water** accounts for 0.65ha of the study area.

- 8.9.38 The River Annan is by far the largest watercourse within the study area. The river is a significant habitat for wildlife including brown and sea trout, Atlantic salmon, brook lamprey, European eel, otter, kingfisher, and osprey.
- 8.9.39 The part of the site containing the turbines is drained most obviously by a few smaller rivers and their various feeder burns. In the north-west of the site, the high ridges drain to the Glengap Burn and the Wamphray Water. The Glengap Head/Craig Fell ridge drains to the west through Hodge Burn and Washy Burn. These have several small feeders, including networks of interconnecting feeders in the Laverhay Forest on the east side of the Wamphray. The largest watercourse in the eastern part of the site is the Dryfe Water. There are a few other long watercourses that are its main tributaries: Cocklaw Burn, The Caple and the Waterhead Burn. These small rivers and burns represent the habitat **G2 Running water**.

#### Woodland, Scrub and Bracken

- 8.9.40 Conifer plantations (**A1.2.2 Coniferous plantation**) cover large areas of the survey area, some undergoing current felling operations and many recently replanted. Several of the latter areas have been mapped as **A4.2 Recently felled conifer woodland**, diverging from normal Phase 1 methodology in order to give a clearer impression of the current state of the habitats. It is known that those areas are intended to be replanted. The plantations have not been surveyed in any detail as with dense planting there is little or no semi-natural vegetation persisting, except along a few rides, watercourses and track margins (but here scarcely any woodland and only patchy scrub). There has been some native broadleaved woodland planting about larger watercourses in the south of the plantation zone (A1.1.2), and some mixed plantation (A1.3.2) was mapped on ground that was included in a previous iteration of the wind farm design.
- 8.9.41 **A1.2.2 Coniferous plantation** accounts for 2,374ha within the survey area. **A 4.2 Recently felled coniferous woodland** accounts for 706.1ha.
- 8.9.42 Mature broadleaved woodland (**A1.1.1 Semi-natural broadleaved woodland**) occurs along the lower stretches of the Dryfe Water, The Caple and the Cocklaw Burn in the far south but it is poorly represented or absent at higher elevations in the rest of the survey area. The only exception is some scrubby woodland associated with the Glengap Burn in the north-west. These woodlands are associated with watercourses and tend to be of the valley Ash *Fraxinus excelsior* woodland type (NVC W9), indicating some mineral enrichment. Their upper slopes grade from acid grassland or bracken and have affinities to more acidic Oak woodland *Quercus* sp (NVC W11).
- 8.9.43 **A1.1.1 Semi-natural broadleaved woodland** occupies 42.6ha of the mapped area.
- 8.9.44 There has been some native woodland planting about larger watercourses in the south of the plantation zone (**A1.1.2 Broadleaved plantation woodland**), and some **A1.3.2 Mixed plantation** was mapped on ground that was included in a previous iteration of the wind farm design. Those habitat types occupy 75.4 ha and 15.8 ha respectively.
- 8.9.45 **A2.1 Scrub** occurs at the woodland areas noted above (often predominantly), where it tends to be of the thorn type (NVC W21). There are some areas with patches of willow scrub. Several patches are typical of wet carr woodland (NVC W1) with Grey Willow *Salix cinerea* dominant and much Marsh Bedstraw *Galium palustre* and Soft Rush. Others, particularly where the soil is a little acid, have much Eared Willow *Salix aurita*, or Goat Willow *Salix caprea*. Those are coded in the habitat map as 'WSx'.
- 8.9.46 **A2.1 Scrub** occupies only 16ha of the survey area.

- 8.9.47 Bracken stands *Pteridium aquilinum* occurs sporadically throughout, mostly on steeper ridges or valley sides, but is extensive in the north-west around Glengap Burn and on the western fringes at Gallatae, where grazing is presumably limited. Most of the bracken vegetation appears to be derived from acid grassland pasture (NVC U20) with no obvious woodland type (NVC W25) although this may occur locally about the steeper watercourse slopes in the plantation zone where access is difficult.

- 8.9.48 **C1.1 Continuous bracken** makes up around 130ha of the study area.

#### Natural rock exposures and waste

- 8.9.49 Two small sections of naturally occurring inland cliff (**I1.1.1 Inland cliff**) are found at Glengap Craig in the western part of the site. It was not possible to sample the cliff vegetation closely. The habitat accounts for a very small 0.05ha.
- 8.9.50 There are some open scree areas (I1.2.1), notably above Gallatae and around Glengap Burn in the north-west of the site. They are often hidden by tall Bracken and Heather stands. Mosses, lichens and ferns are prominent there (NVC U21) however Parsley Fern *Cryptogramma crispa*, usually integral to this community, is present in very low amounts.
- 8.9.51 There is a very small 2.2 ha of scree in the survey area.

#### Miscellaneous Habitats

- 8.9.52 Small areas of **J4 Bare ground** occur (2.1ha), scattered throughout the site. These small patches are where soil has been exposed on agricultural ground by working vehicles or animals, or where there is bare, stony ground left after previous quarrying. Bare ground occupies a small 5.7ha of the study area. A small area of **J1.2 Amenity grassland** is to be found at the Dryfehead Bothy, measuring 0.05 ha. Patches of **J1.3 Ephemeral/short perennial** vegetation (0.5ha) occur in the farmland and former quarry areas in the western part of the study area.

#### Notable plant species

- 8.9.53 Since much of the area is dominated by bog vegetation and long-grazed acid grassland, both somewhat uniform, the core vascular species diversity is fairly limited. However, a few flushes, rock exposures or screes (often around watercourses), add to the overall species diversity.
- 8.9.54 The upland blanket bog elements such as Cloudberry and Cowberry seem to be limited in scale, and the easily overlooked Lesser Twayblade *Neottia cordata* was only noted on a couple of occasions but may well be more widespread.
- 8.9.55 Where the ground is free-draining, and the habitat more heath-like, species of interest included a few records for Common Cow-wheat *Melampyrum pratense*, Stag's-horn Clubmoss *Lycopodium clavatum* and Parsley Fern. Heath Pearlwort *Sagina subulata* was notable, confined to forest track gravels, such as at Dundoran Plantation. There was one record for Starry Saxifrage *Saxifraga stellaris*, but this occurs by a small stream adjacent to the track in the higher reaches of the Dryfe Water.
- 8.9.56 At lower elevations there are a few flushes of interest and some areas of less acidic grassland that encourage more diversity. Species of local interest there, usually sparingly, include Fen Bedstraw *Galium uliginosum*, Tawny Sedge *Carex hostiana*, Hairy Oat-grass *Avenula pubescens*, Smooth-stalked Sedge *Carex laevigata*,

Melancholy Thistle *Cirsium helenoides*, Scurvy-grass *Cochlearia officinalis*, Lesser Pond-sedge *Carex acutiformis*, Stone Bramble *Rubus saxatilis* and Burnet-saxifrage *Pimpinella saxifraga*.

- 8.9.57 Bryophytes were recorded, though not sampled in any detail, and only a provisional species list is provided. As with the vascular plants, the bryophytes are typical of acid grassland and bog habitats. A good range of bog-mosses was noted, however, including *Sphagnum teres* and *S. russowii* and there was some *Leucobryum glaucum*. Further diversity is associated with usually small flushes where *Palustriella commutata* could be abundant.
- 8.9.58 Lichens were seldom noted, other than in bogs or heaths with shrubby *Cladonia* species. The limited local rock outcrops and scree might reward more detailed sampling.

## 8.10 Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

- 8.10.1 The NVC communities identified over the course of the surveys have been assessed against criteria provided in SEPA guidance relating to groundwater dependency, which is set out in Table 8.9. Further information regarding the groundwater dependency is detailed in the following paragraphs. Figure 8.4 shows the wind farm infrastructure overlying the NVC communities within a buffer defined by 100m from access tracks of cut typologies and 250m around deeper excavations.

**Table 8.9 – Groundwater Dependency Scores**

Score	Description
1	Denotes 'Strong dependency on groundwater discharge from bedrock or superficial aquifers at a majority of sites'.
2	Denotes 'Likely to be some dependency on groundwater discharge at a majority of sites – either direct from recognised aquifers or indirectly as recharge from minor aquifers in superficial deposits. Water from other sources (surface run off, overbank flooding etc) may also be very important'.
3	Denotes 'Groundwater discharge usually irrelevant. Site fed by other water sources. This may include components of ombrogenous systems with intrinsic groundwater system fed by rain.'

- 8.10.2 In relation to the above Table 8.9, U6 *Juncus squarrosus-Festuca ovina* grassland, M15 *Trichophorum cespitosus-Erica tetralix* wet heath, and M25 *Molinia caerulea-Potentilla erecta* mire, M27 *Filipendula ulmaria-Angelica sylvestris* mire, MG9 *Holcus lanatus-Deschampsia cespitosa* grassland, MG10 *Holcus lanatus-Juncus effusus* rush-pasture and W1 *Salix cinerea-Galium palustre* woodland, have a groundwater dependency score of 2, considered likely to be moderately groundwater dependent.
- 8.10.3 Many intermediate communities were identified, such as 'M15-U5', 'MG10-U4'. In the great majority of cases, the intermediate vegetation has been assessed as having low groundwater dependency.
- 8.10.4 M4 *Carex rostra-Sphagnum fallax* mire (in intermediate communities 'M4-M6' and 'M6-M4'), M6 *Carex echinata-Sphagnum fallax/denticulatum* mire, M10 *Carex dioica-Pinguicula vulgaris* mire, M23 *Juncus effusus/acuteiflorus-Galium palustre* rush-pasture, M37 *Palustriella commutata-Festuca rubra* spring, U16 *Luzula sylvatica-Vaccinium myrtillus* tall herb community and W7 *Alnus glutinosa-Fraxinus excelsior-*

*Lysimachia nemorum* woodland are thought to be highly groundwater dependant and have the groundwater dependency score of 1.

- 8.10.5 Intermediate communities between highly communities, identified by SEPA as possibly being highly groundwater-dependent, such as 'M23-M6' and 'M4-M6'. Those would be assessed as possibly having high groundwater dependency.
- 8.10.6 GWDTE communities have been identified using the plant communities described in the SEPA guidance for identifying GWDTEs<sup>35</sup> but also taking into account underlying geology and hydrology.
- 8.10.7 Out of both categories of groundwater dependency, the following communities can be removed from the discussion: W1 woodland, W7 woodland and M37 mire. The woodland communities lie well outside the zone of influence, being found in the riparian woodlands along the main watercourses. The M37 mire communities are extremely small. The locations on lower slopes are indicated by target notes. Three springs are found on the slopes of Howgill Fell, Heatherybrae Head and Criffel. Two of those lie well outside the 250m buffer around the turbine excavations. The other one lies just on the edge of the buffer and is unlikely to be impacted by the development.
- 8.10.8 Also removed from further discussion are NVC U6 grassland and M15 wet heath. U6 grassland on the site is strongly associated with blanket mire communities (mainly M19 and M20) on plateaux or shallow slopes. It is taken to represent a secondary type of vegetation derived from those blanket mires over a long period of heavy grazing pressure, and therefore to be an ombrogenous community.
- 8.10.9 The NVC M15a *Carex panicea* sub-community is the *soliginous* sub-community that justifies the inclusion of NVC M15 in the SEPA guidance. This community is not present within the survey areas. The other sub-communities present, the typical sub-community and (mainly) the grassy M15d, are considered to represent mire vegetation on thin peat. They are also dismissed following the discussion in the following paragraphs.
- 8.10.10 The remaining communities require to be examined from the perspective of their groundwater dependent status in relation to the specific conditions and locations at the site of the proposed wind farm. Three main rock formations underlie the main turbine area of the site. Those are the Glendearg Formation in the north, the Carghidown Formation (Metasandstone and Metamudstone) below that across the central area and extending to the south west, and the Hawick Group (Wacke) in south eastern part comprising the Silton Forest area. Younger rock formed in the Permian Period overlies those older Silurian rocks in the extreme west of the site, at Dundoran Plantation. That is the Hartfield Formation (Sandstone, Pebbly Sandstone and Angular Pebble-Grade Conglomerate).
- 8.10.11 The older Silurian formations have the same characteristics. They are all low productivity aquifers, with flow taking place vertically through fractures and other discontinuities. There is only limited groundwater in the near surface weathered zone and secondary fractures. Those rock formations underlie the main wind farm 'turbine' area.

<sup>35</sup> SEPA.2017 LUPS Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems



- 8.10.12 The younger Hartfield Formation is classed as a high productivity aquifer with both intergranular and fracture flow. The younger rocks underlie much of the area that is proposed to contain a long access track that begins to the west of the M74 motorway.
- 8.10.13 On that basis the remaining community that was considered in the SEPA guidance as moderately dependent on groundwater, M25 mire has to be considered to have low groundwater dependency at the site. This is supported by its consistent association in vegetation transitions between ombrogenous communities, such as M20 mire, or in its association with M15 wet heath communities on thinning peat. Only the GWDTEs that are given as ‘highly dependent’ in the SEPA guidance are now discussed further. These are: intermediate mires (variously intermediates between M4 and M6, M23 and M6, or in some cases intermediate communities with grassland types), M6c mire, M6d mire, M10 mire and M23a and M23b rush-pasture.
- 8.10.14 Several examples of M6c and M6d mire and a small number of intermediate stands that include M4 mire occur in a linear network of natural surface depressions (and also within man-made drains or ‘grips’) within or at the edge of sections of ombrogenous mire. In those situations, those examples are considered also to be dependent on rainfall, and so have a low groundwater dependency there.
- 8.10.15 On lower slopes there are several examples of M6c and M6d mire, M23a and M23b rush-pasture and many intermediate stands. There is also one example of M10 mire and a small number of M37 springs (too small to map). In those situations, M6c and M6d mire are likely to have low groundwater-dependency at most locations. M23a, M23b, M10 and M37 may be considered to be at least moderately groundwater-dependent at some locations, where they support a distinctive range of associate herbs due to the presence of either circum-neutral or base-rich irrigating water.
- 8.10.16 The GWDTE sensitivity of all habitats is summarised in Appendix 8.18.

## 8.11 Species (Site Survey)

### Bats

- 8.11.1 The Proposed Development is situated on open moorland habitats and adjacent to conifer plantations. According to the Bat Conservation Trust Guidelines (2013), those habitats are judged to be of low value to bats.

### Roost Survey Results

- 8.11.2 There are several farms and other buildings within the developable construction site that is shown on the map by the red line site boundary, but none of those is within the zone of influence defined for bats. It is very likely that there will be bat roosts at some of those properties, such as the farm Leithenhall. Bat activity (pipistrelles) was found to be high in this general area. There are only a small number of buildings within the site boundary: a shed at Dunscore Hill beside the existing forestry access track, the Dryfehead Bothy and two dwelling houses in the Finniegill area. All the properties are surrounded by coniferous plantation. The shed at Dunscore Hill was assessed as having low roost potential as it has a type of construction with multiple vents in its upper half and an opening that has been installed to allow access by owls. The bothy at Dryfehead had already undergone much recent restoration work at the start of the survey period in 2017, with evident repairs to the roof and re-pointing work done. That work continued into 2018. The bothy was examined and assessed as having no potential roost features (PRFs). There is a roost in the older, original property at Finniegill, along the course of the Dryfe Water, and surrounded by coniferous plantation.

- 8.11.3 The extent to which bats associate with non-native commercial conifer plantations is relatively unexplored, however recent findings have shown that they may be an important habitat for *Pipistrellus* species mainly *Pipistrellus pygmaeus*.<sup>36</sup> Bats have been found to roost in conifers if they are mature and have suitable holes and cracks and upland conifer plantations can provide suitable foraging and commuting habitats<sup>37</sup>.
- 8.11.4 At the time of writing, much of the eastern plantation (Silton Forest, Rue Gill and Dryfehead areas) has a very low cover of felling age trees and harvesting is underway in the Laverhay Forest.
- 8.11.5 Mature broadleaved trees are very localised within the developable site, mainly confined to the riparian woodlands along the Wamphray Water and in the Dryfe Water SSSI. Otherwise there are only isolated scattered trees, such as two large mature Sycamore trees beside the Dryfehead Bothy and some older trees along field boundaries in the southern part of the site, all with limited PRFs. These were not surveyed for roosts as they are unaffected by the development.
- 8.11.6 There are no old stone bridges over the watercourses in the site. Culverts, that support few potential roost features (PRFs), have been used for the crossings.
- 8.11.7 One bat roost survey was undertaken at Finniegill where the resident of the older property had indicated the presence of a natal roost. An emergence/re-entry survey undertaken on 9<sup>th</sup> and 10<sup>th</sup> September 2019 recorded 20 Bats emerging/re-entering the roost. 17 of the 20 bats used three main parts of the main dwelling house. Three bats were observed re-entering the shed adjacent to the house on its east side. It is quite likely that the late date of the roost survey missed a higher earlier number of bats, since by then some bats may have dispersed to other roosts. Both Soprano and Common Pipistrelle bats were recorded by the bat detectors. It is not possible to say clearly if one particular species is roosting there, or whether small numbers of both species are roosting in separate small roosts in different parts of the building.

### Remote Bat Detector Results

- 8.11.8 Static remote detectors presented an often highly variable picture of bat activity around the site. High numbers of passes were recorded on lower ground beside linear features such as watercourses or woodland edge. In early June 2018 over 4000 pipistrelle passes were recorded over a 7-day period at Sembletree Burn. During the same period, and within the same survey area, over 1000 pipistrelle passes were recorded along a strip of broadleaved trees left at the edge of a felled plantation north of Winshields Hill. In the same recording area, at Gudewife’s Hill, from a bat recorder placed in unpromising habitat on a snag remaining in clear-fell, there were no bat passes.
- 8.11.9 The same preponderance of pipistrelle species was found in the results from the static detectors as has been noted from the bat activity transect results. There were similarly small numbers of *Myotis* species, Noctule and, additionally, Brown Long-eared Bat *Plecotus auritus*.

<sup>36</sup> Kirkpatrick, L. (2016) Bat exploitation of Sitka Spruce Plantations: Impacts of management on bats and nocturnal invertebrates. University of Stirling.

<sup>37</sup> Woodland management in the presence of bat species. Guidance for compliance with the Habitat Regulations. [www.bats.org.uk/.../Woodland\\_management\\_in\\_the\\_presence\\_of\\_bat\\_species\\_Wales](http://www.bats.org.uk/.../Woodland_management_in_the_presence_of_bat_species_Wales)

- 8.11.10 Following a temporary change in the design of the wind farm, the Dundoran detectors were placed out only on one occasion, early in the season, at the end of May 2018. The results of the single placement were varied considerably. The recordings from the detector on Broadfield Height contained the greatest number of passes, with a little over 300 pipistrelle passes over a period of 5 days. The detector was placed on a stone wall that runs from the valley bottom of the Glengap Burn and continues roughly north to the eastern slopes of Gallatae and Craig Fell. The wall likely provides a suitable linear feature for bats that forage along the Wamphray Water and Glengap Burn valley. Two other detectors were placed on the west side of the Broadfield Height/Windshield Hill ridge. The detector at the edge of a ride in the Dundoran Plantation detected much less records over the recording period (45 pipistrelle passes and 6 *Myotis* bats) and the detector near Burnt Mound, placed alongside a defunct wall, recorded no passes. The detector at the highest elevation, on Craig Fell, recorded a smaller number of pipistrelles than found at Broadfield (a little over 600), and a small number of Noctule passes (7).
- 8.11.11 The Gillesbie detectors recorded a large number of bat passes at specific points, as already mentioned above. The very high number of bat passes at the Sembletree Burn (by far the highest number recorded during the remote detector survey) confirms the known high value of watercourses for bats generally and it is certain that the Dryfe Water (to which Sembletree Burn and The Caple are connected) and its feeder burns is a significant corridor network for bats within the study area. Much smaller numbers of passes were recorded at other locations, Gudewife's Hill and Gillesbie Hill, though with unusual variations. At both locations, during separate recording periods, no bat passes were recorded.
- 8.11.12 The Ruegill Hill/Ramshaw Rig area detectors recorded very few passes, generally, with one exceptional peak of activity on Ruegill Hill/Peat Rig. At that location, where the detector was placed on a young spruce tree at the end of an overgrown access track, just under 220 pipistrelle passes were recorded. The track provides a suitable linear feature for pipistrelle species. After many years of little use, much of the track length has been colonised by low-growing willow bushes and immature spruce trees. Noctule was recorded only by the Ramshaw Rig detector that was placed on a dead snag within an area of clear-fell/replant. Small numbers of *Myotis* bat passes were also recorded there and additionally by the Dryfehead valley recorder (placed at the edge of the track leading to the upper valley). Supplementary data from AudioMoth detectors in early May 2019 from three locations along the Dryfe Water included a small number of pipistrelle passes (17 common pipistrelle, 1 soprano pipistrelle over a period of 11 days) at the location near the Dryfehead Bothy.
- 8.11.13 The Siltan Forest area detectors gave a very small number of results from their first deployment in mid-May 2018 when only two pipistrelle passes were recorded at the small open area of relic blanket bog below the north-eastern slopes of Macmaw Hill. Thereafter the number of bat passes increased, giving a peak in July over a period from 10/07/18 to 16/07/18. Pipistrelle passes were by far the greatest number, with around 530 passes. Just under 90 passes of *Myotis* bats were recorded. Also, there were small numbers of Noctule (9) and Brown Long-eared bat passes. In general, the highest numbers of passes were recorded by the detector placed near the large foresters' shed beside the track (where there is a clearing planted with young broadleaved trees), though the highest number of Noctule passes was recorded by the detector at Little Brown Knowe. The number of passes recorded at the location on the western slopes of Macmaw Hill remained notably low throughout the whole period of remote survey. That part of the site also was found to have little or no bat activity during the transect surveys.
- 8.11.14 The South Loch Fell/Dun Moss recorders found rather small numbers of pipistrelle, Noctule and *Myotis* species. Both recording periods from the detector fixed at a strainer post in open ground at Dun Moss, the further north of the two detector locations, had single figure numbers for pipistrelle species and Noctule. Noctule was not recorded at the southern of the two locations, where there were both Common and Soprano Pipistrelle and one *Myotis* bat, the latter only during the second recording period. Peak pipistrelle pass numbers at the southern of the two locations, on South Loch Fell, were 89 Common Pipistrelle and 17 Soprano Pipistrelle.
- 8.11.15 The Three Mullach Hill detectors recorded a high number of pipistrelle passes. Numbers were higher by far at the location at the track edge on the east side of the hill, closest to the roost location, and beside an open ride leading to the valley bottom. Pipistrelle passes numbered 775 over a recording period of 5 days. Soprano Pipistrelles accounted for 303 passes, 50kHz pipistrelles (not assignable to either Common or Soprano Pipistrelle) numbered 25, and there were 447 Common Pipistrelle passes. Fewer numbers of passes were detected at the other two locations, both of those situated in the open clear-fell/replant areas that will contain the turbines. Numbers were rather high at the southern of the two locations where there were just over 230 pipistrelle passes. Small numbers of Noctule passes (2, 3 and 4) were recorded at each location and there were similarly low numbers for *Myotis* bats and Brown Long-eared bats, both genera confined to a single location.
- 8.11.16 Appendix 8.12 summarises the number of bat passes recorded each month (by remote detectors). Numbers of bat passes can be seen to vary a great deal, likely depending on location, habitat, weather conditions, height above sea level and time over the season. However, some variations are hard to explain, with apparently poor and unpromising locations (open clear-fell) recording on specific occasions similar results to more promising linear habitats (track edge with scrubby trees). These oddly skewed results have been observed in data from other wind farm surveys as well.
- 8.11.17 The highest number of 5,438 passes was recorded beside the Sembletree Burn at approximately 270m.
- 8.11.18 It is likely that this large number indicates the value of the watercourse corridors in that particular part of the site for bats: the sheltered course of the Sembletree Burn feeds The Caple that joins the larger Dryfe Water, the latter two having large extents of marginal broadleaved woodland and scrub.
- 8.11.19 Other peaks of activity were noted beside the shed in Siltan Forest (July 2018) at the shed location beside the track at the edge of coniferous plantation and beside semi-improved pasture along a strip of broadleaved trees and scrub at the edge of the harvested plantation.
- 8.11.20 Bats were also recorded in other areas outside the survey time as surveyors left the site including Leithenhall, Kirk Brae, Milne Wood and Shankend.
- Bat Activity Survey Results
- 8.11.21 Full results from all the activity surveys are provided in Appendix 8.11, and the results from the remote detectors in Appendix 8.12.
- 8.11.22 During all transect surveys the overwhelming majority of the bat records were of either Common *Pipistrelle Pipistrellus* or Soprano Pipistrelle *Pipistrellus pygmaeus*. There were a small number of records of *Myotis* species and Noctule *Nyctalis noctula*. The great majority of records from transects were of bats flying along the edges of conifer plantations or other linear features within the site, where the bats were feeding and commuting and were often seen by the surveyors. There were very few bat passes recorded over the open and/or higher ground.
- 8.11.23 Seasonal peaks were noted in the months of July and August 2018.

- 8.11.24 The Dundoran transect in early May gave only a small number of results from within the zone of influence for bats. No bats were detected in the Dundoran Plantation or on the open ground from the north of Dundoran to Burnt Mound and until the lower slopes of Broadfield Height. On Turf Hill, Windshield Hill and Leithenhall Rig there was a *Myotis* bat pass and a small number of pipistrelle passes were recorded. Once at the southern side of the Leithenhall Rig shelterbelt at the edge of the developable site, there were several pipistrelle passes and one of a *Myotis* bat in the lee of the wood (wind NE). After the end of first transect, the recorder was kept running and there were several more pipistrelle records along the field boundary on the way to the farm. Finally, at Leithenhall Farm, while the surveyors were in conversation with the tenant farmer at the edge of the farmyard, there was considerable pipistrelle activity being recorded by the detector, and also at the woodland along the Leithenhall Burn, south of the farm.
- 8.11.25 The Laverhay transects recorded very few bats at the start, while walking up through the low-lying pastures of Laverhay Farm. The one notable exception was a small number of Noctule passes at the shelterbelt and along the track below Alkie Knowe, on one occasion. Few passes were recorded over the long stretch from the edge of the improved pasture, through acid grassland and onto the Milne Height ridge blanket bog, until approaching the edge of Laverhay Forest on Laverhay Height. Records over that part of the transect were all of pipistrelles. By far the largest numbers of passes were along the edge of the Laverhay Forest while descending from Laverhay Height to the track and sheepfold. All bat passes there were either of Soprano or Common Pipistrelle. Activity was very low at the start of the survey in mid-May, and on the last visit, in mid-October, no bat passes were recorded.
- 8.11.26 The Gilliesbie transect gave relatively few results. Surveyors used agricultural tracks for part of the survey and crossed habitats that had been improved somewhat for the grazing of cattle and sheep, though retaining some small scattered patches of blanket bog or unimproved acid grassland. The results were almost all of pipistrelles, scattered randomly throughout the area, along the agricultural track or on some of the highest ground, e.g. Loft Shaws (326m). There were two records of a *Myotis* bat, one close to The Caple (tributary of Dryfe Water) and the other on open ground at Loft Shaws. The earliest visit in May recorded only two pipistrelles at the very edge of the site and outside the transect at the B road near Shankend. The last visit in October recorded only three pipistrelle passes. The intervening transects had scarcely more numbers of passes, with four passes of soprano pipistrelle recorded at one listening point in June.
- 8.11.27 The Three Mullach Hill transect gave few results from the first three visits in the season. Transects undertaken in mid-May and early and mid-June returned very low numbers of bat passes, all of pipistrelle bats. Two months later in August there was a much larger number of passes recorded. That may reflect a sudden increase in a particular food supply at that time or/and an increase in the number of bats from a potential maternity roost at Finniegill.
- 8.11.28 The Silton Forest transect gave many records of pipistrelle bats and occasional Noctule and *Myotis* bat. Two clusters of activity were noted. The larger cluster was in the southern part of the transect, from Macmaw Hill to Andrew's Rig, where large rides run up the slopes from the Dryfe Water, with smaller feeder burns and seepages running through mainly semi-natural vegetation (with a little recent broadleaved plantation locally). It is likely that those rides provide a productive edge for bats to follow up from the Dryfe Water. Bats were frequently seen near the start of the transect flying along just above the top of the treeline. The much smaller cluster was in the vicinity of Crush Gutter, where the forestry access tracks run across the Dryfe Water by way of various culverts. Long stretches of track to the west of Dod Hill and on the north west slopes of Macmaw Hill had few records or none. The smaller cluster possibly reflects increased activity associated with the Finniegill roost. The larger cluster suggests a possible roost further south in the Dryfe Water valley.

- 8.11.29 The Rue Gill Hill transect gave very few results. A small number of bat passes (mostly pipistrelles with one *Myotis* bat) was recorded on low ground below the turbine ridges, along the watercourse at Duncan's Cleuch and along the scrub-edged track from there down to the bothy at Dryfehead. There was only one record from the higher ground on the transect, a pass by a Common Pipistrelle from along the overgrown track out to the grouse butts on Peat Rig.

#### Otters

- 8.11.30 Otter evidence is summarised within Appendix 8.14 and shown on Figure 8.7. Sensitive information on holts and lie-ups are contained within the separate Confidential Annex. Otter activity was recorded on many of the watercourses including the Dryfe Water and its tributaries. It is highly likely that most watercourses and bodies within the ZOI are used by a small population of otters at certain times of year especially in spring when otters are likely to use the watercourses to access moorland pools, when frogs are active.

#### Water Vole

- 8.11.31 Despite the habitat appearing to be possibly suitable in some areas of the site, no evidence of Water Voles was found. Generally, the watercourses were generally too fast-flowing and rocky to be suitable.

#### Badgers

- 8.11.32 Badger activity was found commonly throughout the site, with active setts recorded to nearly six hundred metres in altitude at the north of the site. There was a lot of badger activity in some locations where no badger sett was located, suggesting some setts will have been overlooked. Several setts were recorded on open moorland and hill pasture with those habitats also providing rich foraging. Non-sensitive badger information is shown in Appendix 8.15 and on Figure 8.8 and sett information is detailed in the Confidential Annex.

#### Brown Hare and Mountain Hare

- 8.11.33 Brown hares were often observed from the vehicle on tracks within the large conifer plantation area in the eastern part of the site. The animals were particularly often seen on the ascent of Three Mullach Hill after the crossing of the Dryfe Water. No mountain hares were recorded.

#### Red Squirrels

- 8.11.34 Red squirrels *Sciurus vulgaris* were commonly sighted out with the survey area by surveyors travelling to and from the site but rarely within the survey area. There were several records of red squirrel from the camera trap survey of the Silton Forest area. Cones stripped by squirrels were found where the survey areas extended into conifer plantations. It is not possible to eliminate grey squirrel from feeding signs alone. Six baited hair tubes were set-up in the south of the site where it was felt the habitat was most suited to squirrels due to the maturity of the trees and the proximity to areas of deciduous woodland. No dreys were located.

- 8.11.35 The locations are shown on Figure 8.9.

#### Pine Marten

- 8.11.36 There were no direct observations of pine marten during the course of fieldwork on site but there were one or two instances of scats being found that were thought to belong to this species. The most conclusive evidence of presence was collected from one of the baited hair traps set-up in the south of the site where

the paired camera traps recorded a brief view of a marten at the edge of Siltan Forest. The first location of a scat was at the side of the forestry access track at Finniegill Burn NY 15685 99315 in summer 2017. The second location of a scat was at the eastern edge of the Siltan Forest. Fountain Forestry's ecological surveyor (pers comm David Smith) found a scat (2019) at approximately NY 17261 94708, in coniferous plantation.

8.11.37 The locations are shown on Figure 8.9.

#### Other Mammals

##### Deer

8.11.38 Roe deer *Capreolus capreolus* were often seen using the edges of the conifer woodland and feeding out on to the moorland. There were no observations of red deer *Cervus elaphus* or sika deer *Cervus nippon*.

##### Rabbits

8.11.39 Rabbit *Oryctolagus cuniculus* warrens to the northeast of the site provide a significant food source for the golden eagle.

##### Fox *Vulpes vulpes*

8.11.40 Droppings, tracks and paths were commonly recorded throughout the site.

##### Mole *Talpa europaea*

8.11.41 Molehills are common in some areas including well into the forest alongside the forest roads and in the lower open grazed areas.

##### Field Vole *Microtus agrestis*

8.11.42 Occasional animals seen on the moorland and rough grazing, with latrines and runs noted in grassy and rush covered areas.

#### Reptiles

##### Common Lizard

8.11.43 Common Lizard was recorded occasionally on the moorland areas of the site. Records are shown in Appendix 8.16

#### Amphibians

8.11.44 Frogs and occasionally toads were recorded in wet areas on the open ground and within the forest, particularly in spring.

#### Butterflies and moths

8.11.45 Scotch Argus *Erebia aethiops* was recorded frequently along the verges of forestry access tracks in the eastern part of the site, particularly in the Siltan Forest and Rue Gill Forest areas. Small heath butterflies *Coenonympha pamphylus* were very common throughout the site. In the summer of 2019, Painted Lady butterflies *Vanessa cardui* were recorded in the eastern parts of the site, both in lower areas such as the tracksides in the Siltan Forest and along watercourses such as the northern part of the Dryfe Water. Common Blue *Polyommatus icarus* was found in a small area of species-rich grassland (NY 17419 94448) in

the Siltan Forest, along a stretch of forestry track where Scotch Argus was present in good numbers in late summer 2018. Small Pearl-bordered Fritillary *Boloria selene* was also seen at the above location, and also in other areas of damp or marshy grassland and marshy woodland rides throughout the site. Peacock *Aglais io*, Small Tortoiseshell *Aglais urticae* and Red Admiral *Vanessa atalanta* were seen often generally throughout. Other butterflies regularly recorded were Green-veined White *Pieris napi*, Orange Tip *Anthocharis cardamines*, Meadow Brown *Maniola jurtina*, Small Copper *Lycaena phlaeas* and Ringlet *Aphantopus hyperantus*.

8.11.46 Emperor Moth *Saturnia pavonia* was occasionally observed in heather moorland habitat, such as on Scaw'd Fell. The Common Footman moth *Eilema lurideola* was frequently seen along the edges of forest areas during a summer visit in 2019.

#### Fish

8.11.47 The series of fish surveys extended over a significant area of the Dryfe Water and Wamphray Water catchments, straddling main tributaries with their own specific physical and geological features. Each tributary has its own riparian habitat type and characteristics and as a consequence, fish population densities and diversity has varied from watercourse to watercourse. The location of the fish surveys is shown on Figure 8.6.

8.11.48 Results are given in Appendix 8.17. The survey concludes that, in the watercourses surveyed within the vicinity of the proposed Scoop Hill Wind Farm:

- Both the Dryfe Water and Wamphray Water sub-catchments were assessed to contain habitat features that are optimal for salmonids;
- Atlantic salmon are currently absent from the upper reaches of the Wamphray Water, closest to the Scoop Hill wind farm, historically excluded from that area by a culvert at the railway line and the natural waterfalls in Wamphray Glen;
- Despite some doubts regarding the ability of adult salmonids to ascend the Wamphray Glen waterfalls, good numbers of returning adult salmon and trout in the Wamphray Water sub-catchment are predicted in the future following population re-establishment after recent installation of a new fish pass at the culvert, on the basis of the good quality habitat;
- Good numbers of salmonids were recorded in the Dryfe Water sub-catchment, where the population has remained stable in line with results over the Annan catchment;
- Stone loach *Barbatula barbatula* has been recorded on all surveys of the Wamphray Water sub-catchment, though limited to low gradient stretches and should be expected in the lower reaches; and
- European eel *Anguilla anguilla* is currently absent from both sub-catchments but is expected to re-colonise given the extent of suitable habitat, following the removal of a barrier currently in place at the foot of the River Annan;

8.11.49 Several locations in the watercourses were classed as being 'excellent' or 'good' due to the number of salmonids per 100m<sup>2</sup>. These included the locations 'Wy4', 'Wy3', 'Wy8' and 'Wy9' below the Wamphray Glen waterfalls where numbers of both salmon and trout fry were noted as 'excellent'. On the Dryfe Water, the locations 'De3', 'De4', 'DeS11' and 'De9' were 'excellent' for trout fry, and 'De7' at the confluence of the Dryfe Water and Stoney Gill was given as 'good' for numbers of salmon fry.

#### Evaluation of Ecological Features



8.11.50 Appendix 8.18 provides an evaluation of the ecological value of the habitat IEFs recorded within the site and Appendix 8.19 provides an evaluation of the ecological value of the species IEFs.

## 8.12 Assessment of Impacts

### Construction and Operational Impacts

8.12.1 The vast majority of impacts relating to the development of wind turbines within the ZOI are associated with the construction phase. Loss or disturbance to significant habitats can be significant and can also have long-term impacts on species through potential loss of breeding and/or foraging habitat, or important wintering habitat. Construction activities themselves can result in disturbance of species through lighting, noise or potential pollution incidents, as well as potential injury to species due to site clearance works such as digging of borrow pits or turbine bases.

8.12.2 Potential impacts which could occur as a result of the operation of the wind farm relate largely to risk of collision for bats.

8.12.3 There are also potential disturbance issues relating to noise of the operational turbines, as well as higher levels of disturbance resulting from an increase in visitors to the site. This could result in displacement of certain sensitive species from the area, resulting in a change in the local distribution and/or abundance of species. Operational impacts could occur over the operational lifetime of the wind farm, although some species may become habituated to the conditions on site so these impacts may lessen over time.

8.12.4 The potential impacts associated with the habitats and species of importance recorded in the area are detailed below. The significance of these impacts is assessed first of all in the absence of any mitigation.

### Western Southern Uplands and Inner Solway Natural Heritage Zone

8.12.5 There are a number of objectives and actions addressing the priorities of the Western Southern Uplands and Inner Solway Natural Heritage Zone. The ones likely to be impacted upon are:

- To encourage sustainable rural development and to maintain and restore semi natural habitats in farmland in lowland and upland areas and enhance linkages and corridors;
- To maintain and enhance landscapes, including designed Landscapes, coast, lowland and upland farmland, woods and forests, and geological and geomorphological sites;
- To encourage natural river processes, maintain sustainable aquatic biodiversity including fish populations, and improve water quality and riparian habitat throughout river catchments; and
- To maintain populations of characteristic species and increase overall species diversity.

8.12.6 The Proposed Development has the potential to adversely affect semi natural habitats and landscapes in forest and in farmland in upland areas. There is also the potential to adversely affect the aquatic environment. However, there is also the potential to enhance habitats and species diversity. These effects are dealt with in the sections below.

### Designated Sites

8.12.7 There is only one designated site with potential habitat connections to the development site, Dryfe Water SSSI, along the southern edges of the developable site.

8.12.8 There will be no loss of habitat from the designated site or other direct impacts. The only risk is a negative impact along the edge of the site to the watercourse from silt and other pollutants during the construction phase of the wind farm. The potential for negative impacts is considered to be **negligible**.

### Habitats

#### Impacts of Construction

8.12.9 Direct impacts of construction take the form of loss of habitat through land-take for infrastructure construction such as turbine bases, access tracks, site compounds, electricity substation and borrow pits.

8.12.10 Indirect impacts of construction include: changes to existing hydrology that could lead to detrimental changes in wetland habitats as a result of increased drainage and/or dewatering; increased pollution risk associated with accidental spillages of fuels and oils; increases in silt-laden run-off and fugitive dust emissions; changes to current land management (e.g. grazing regimes).

8.12.11 The dimensions used to calculate habitat loss are given in Appendix 8.20 and the amounts of the various habitats that will be lost due to the development footprint (based on the 500m buffer around the turbines) can be seen in Appendix 8.21.

8.12.12 A total of approximately 105.34 ha of habitat would be lost to the development. The direct impacts are generally considered to be **low in magnitude** and of **low significance** given the size of the study area, approximately 8,573 ha. The loss of blanket bog, wet modified bog and dry modified bog is approximately 4.2% of the total bog habitats and therefore assessed as being of **low magnitude**, of **minor significance** and **permanent**. The direct impacts on all habitats are low with less than 5% of each habitat resource being lost. Direct impact on other affected habitats is considered to be **minor, hence of minor significance**, due to their small size or low conservation value.

8.12.13 There is no direct loss of GWDTE habitat.

#### Other Construction Impacts

8.12.14 During the construction phase there is scope generally for negative impacts on habitats through the following:

- Spillage of fuels and lubricants associated with vehicles and machinery;
- Spillage of cement;
- Leaching of alkalis into the soil during construction of the turbine bases;
- Deposition of excavated material onto surrounding vegetation communities;
- Disruption to the flow of groundwater; and
- Discharge of silt into watercourses.

8.12.15 Indirect impacts are also likely and are detailed below.

#### Short Term Impacts

8.12.16 If disturbed ground is left bare after all construction operations are completed, erosion of loose material is likely to take place after heavy rain, with a likely loss of soil and established plant species through further erosion and with a risk of vegetation communities down-slope being buried and damaged.

8.12.17 Run-off carrying silt has high potential to pollute watercourses affecting aquatic vegetation and potentially fish and otters.

#### Long Term Impacts

8.12.18 Increased levels of drainage will arise following the construction of cut tracks and turbine crane hardstands. Where new cut tracks follow contour lines, downslope areas can be deprived of normal water flow as it may be diverted away by new drains that lie beside the tracks. However, the design of the wind farm and associated infrastructure has been designed to avoid areas of groundwater dependency.

8.12.19 Significant negative impact is possible on wetland habitats such as bog, wet heath, and marshy grassland or flush.

8.12.20 Drying conditions would lead to the ground no longer being able to support the current diversity of water-loving plants and some conversion over time of habitats such as marshy grassland to dry grassland. It is not possible to quantify changes to the vegetation, but a qualitative negative impact of medium to low magnitude of moderate significance is likely for habitats dependent on either surface water flows or groundwater.

8.12.21 If disturbed soil is left bare for too long after working, for instance, along the edges of the tracks or around turbine areas and crane hardstands, grasses or rushes are likely to temporarily benefit. These changes are likely to be noticed in a fairly short period of time. Prolific seeders, notably Soft Rush *Juncus effusus*, can colonise very quickly.

8.12.22 If bare soil areas are sown with specific species in order to stabilise them, there is the further possibility of preferential grazing by farm livestock of these sown areas on the young fresh growth.

8.12.23 Direct outflow from cross drains onto wet areas with silty or saturated soil can cause damage to vegetation through scouring during times of heavy rainfall. The resulting erosion is very hard to repair and can lead to significant damage over a long period of time.

8.12.24 The positioning of tracks can cause fragmentation of habitat with a resulting loss of capacity for genetic exchange between the newly-separated areas.

8.12.25 It is possible that construction materials foreign to the site may import seeds of plants that do not belong in the habitats or invasive pest species and permit their establishment on disturbed areas.

8.12.26 The construction will result in a mixture of temporary and permanent impacts. Many negative impacts will be negligible however some, such as the drying of bog habitats, have the potential to disrupt the flow of water within wetland habitats/GWDTEs and cause water pollution. The latter are considered to be negative, of **medium magnitude, permanent** and of **moderate significance** and **reversible**.

#### Operational Impacts

8.12.27 Potential operational impacts include disturbance to flora and fauna resulting from turbine operation and maintenance and any changes in land management, such as changes to grazing.

8.12.28 Operational checks, servicing and repair will be undertaken on the turbines on a routine basis following the commissioning of the new wind farm. Since all movement of vehicles will be undertaken using the existing and new access tracks, there will be no additional disturbance to the habitats.

8.12.29 A possible impact is that run-off from the surfaces of the access tracks, could contaminate watercourses and water bodies.

8.12.30 No changes in the management of the site are expected following the construction of the wind farm. The open moorland and pasture will continue to be used for the grazing of livestock. Forestry management and operations will continue as before in the commercial plantations.

8.12.31 It is considered that this impact will be of **low magnitude, long term** and therefore of **minor significance** and **reversible**.

#### Species

##### Bats

##### Impacts of construction

8.12.32 One bat roost was located at Finniegill in the eastern part of the site, counted in 2019 and found to contain around 20 bats. Both Soprano or Common Pipistrelles were recorded, as well as Brown Long-eared bat so it is likely that both species are using the buildings at Finniegill, perhaps with separate small roosts at various locations in either the main dwelling house and/or an adjacent shed. A significant seasonal increase in activity was noted along the track on the eastern slopes of Three Mullach Hill during a drive-round transect in late August 2018, corresponding to the time when young bats would be flying. Static detectors placed near the turbine locations and along the track on the eastern slopes recorded a high number of pipistrelle passes in early September 2019. The increased activity is almost certainly at least partially due to higher numbers of animals after the emergence of the young bats, as well as other undetermined seasonal factors.

8.12.33 The bat roost at Finniegill will not be impacted physically by the construction of the wind farm. The house is over 500m away from the nearest turbine. Additionally, the dwellings at Finniegill and their access track running alongside the Dryfe Water are not included within the construction activity footprint.

8.12.34 There is a possibility of the foraging habitat of the Finniegill bats being subject to a negative impact during construction. Construction activities would be confined to the west side of the ridge along the existing access track and, with most of the likely disturbance of habitat along the centre of the ridge for the construction of new access tracks and turbine pads. Those areas were found to have less activity during the above seasonal peak, with most activity recorded along the busier eastern track.

8.12.35 The level of disturbance would depend otherwise on the time of the year, with any construction work undertaken during spring and summer having greater potential impact. Given that the infrastructure locations are of less significance to the bats, that the construction work is normally undertaken during the months of autumn and winter, and that in the event of spring or summer working, bat activity is likely to take place outside of normal construction hours, any negative impact is likely to be a **low magnitude** and of **negligible significance**.

8.12.36 Bats were recorded foraging and commuting in low numbers within the site near the turbine locations. Therefore, bats could potentially be directly impacted by loss of foraging/commuting habitat associated with construction of the wind farm, as well as indirect impacts via disturbance during the construction period and upgrading of existing forestry tracks. The majority of the bats recorded were along woodland edges so there is likely to be negligible impact on the moorland areas of the development site where the infrastructure is to be located. There is more likely to be disturbance along plantation edges. The level of impact will be dependent on the time of year. If construction takes place during spring or summer, the negative impact has

the potential to be greater. However, since bats feed at night and return to roost early morning their activity time is likely to be outside construction hours. Negative impacts of construction are considered to be of **low magnitude, short term** and of **minor significance**.

#### Impacts of operation

- 8.12.37 The roost at Finniegill appears to contain both Common and Soprano Pipistrelle bats. These species are both common and widespread in the UK. They are both considered to be at medium risk of collision with wind turbines. Given the propensity of both species to utilise more productive edge habitats, as evidenced by the varying activity levels recorded on Three Mullach Hill, and the likelihood that the bats will fly at lower levels generally when present in the poorer habitat at the specific turbine locations, the risk to the foraging pipistrelles is considered to be low. Nevertheless, it remains likely that a small number of pipistrelles might be killed through collision with the turbines. This negative operational impact is considered to be of **low magnitude, long term** and **minor significance**.
- 8.12.38 The great majority of records of bats using the site were for Common and Soprano Pipistrelle, which are both common and widespread species in the UK. Those two species and the additional 50kHz pipistrelles) accounted for around 98% of all transect passes. The Brown Long-eared bat is also one of the most common and widespread species but was recorded very rarely during survey only by the remote detectors. Noctule or *Myotis* bats, that are both less common and less widespread than the above, were also recorded, in much smaller numbers (both a little over 1% of all transect passes).
- 8.12.39 In general, low numbers of bats were recorded crossing the moorland areas where some of the turbines are to be located. Common and Soprano Pipistrelle bats are considered to be at medium risk from collision with wind turbines, since they spend a proportion of the time flying at higher heights. *Myotis* bats and Brown Long-eared bat are considered to be at low risk as these species have been determined to forage at low heights for almost all the time. Noctule bats are considered to be at high risk from collision with wind turbines since they spend much of their time flying at height.
- 8.12.40 In view of the small numbers and the great majority of records from the higher open areas being of pipistrelle species, collision risk is considered to be low in this area. The majority of the bats recorded were on the forest edges. There is therefore a greater collision risk at the turbines situated adjacent to the forest. The impact on bats from the operational wind farm is considered to be of **medium magnitude, long term** and **moderate significance**.

#### **Otters**

##### Impacts of construction

- 8.12.41 There is the potential for impacts on otters through direct habitat loss and disturbance during the construction phase. However, the turbine locations themselves are unlikely to impact on otters and the loss of habitat is considered **negligible**.
- 8.12.42 Otter holts and lie ups are not likely to be impacted upon by turbine bases, tracks or any other infrastructure. Several lie ups were recorded on the Dryfe however these were destroyed by felling works in 2019. Disturbance and displacement during construction is considered to be of a **low magnitude, short term** and of **minor significance**.
- 8.12.43 There is potential for indirect impacts as a result of deterioration in water quality due to pollution incidents during construction. In addition, there is also the potential for otters to become injured or trapped by falling

into deep excavations associated with borrow pits or construction of turbine bases. The indirect negative impact of construction is considered to be of **medium magnitude, short term** and of **moderate significance**.

##### Impacts of operation

- 8.12.44 Although otters have been recorded within the site, it is considered that this species is unlikely to suffer any significant negative impacts from the operation of the wind farm. As otters are mostly active at dusk and dawn there is unlikely to be any significant disturbance to this species due to an increase in visitor numbers. The impact is considered to be negligible.

#### **Badgers**

##### Impacts of construction

- 8.12.45 There is unlikely to be any significant loss of habitat due to construction of the turbine bases and access tracks, just a small loss of foraging habitat. Badger activity is very high and due to the very large size and density of the forest, setts will probably have been missed. Setts are most likely to be lost due to felling operations within the forest however with current information it appears no setts will be lost due to wind farm construction as none were located within 100m of any part of the development. Badger setts will move as forest operations take place. However, it is generally felt that the negative impact on badgers due to habitat loss is considered **low magnitude, long term** and of **minor significance**.

##### Impacts of operation

- 8.12.46 There could however be some disturbance to badgers during the construction phase, due to noise and vibration associated with construction activities, particularly the excavation of borrow pits. However no sett was located within 100m of any proposed infrastructure. As above with otters, there is also the potential for badgers to become injured or trapped by falling into deep excavations associated with borrow pits or construction of turbine bases. It is therefore considered probable that the negative impacts could be of **low magnitude, short term** and of **minor significance**.

#### **Brown Hare**

##### Impacts of construction and operation

- 8.12.47 There will be minor disturbance to this species during construction, however generally the negative impacts of the development are considered **negligible**. It is also likely that the negative impacts of the operating wind farm will be **negligible**.

#### **Red Squirrel**

##### Impacts of construction and operation

- 8.12.48 Red squirrels are present in low numbers. Forest operations will have an effect on this species and populations will move according to where there are mature trees with cone crops. Disturbance during construction could be caused by tree removal with potential to destroy dreys. However, the negative impacts are considered to be of **low magnitude, short term** and of **minor significance**.
- 8.12.49 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Pine Marten**Impacts of construction and operation

- 8.12.50 Pine martens too are present only in small numbers. Disturbance during construction could be caused by tree removal with potential to destroy dens. However, the negative impacts are considered to be of **low magnitude, short term** and of **minor significance**.
- 8.12.51 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Deer**Impacts of construction and operation

- 8.12.52 There is some potential for negative impacts for roe deer during construction of the proposed wind farm due to noise and vibration associated with construction activities. However, this is considered to be **negligible**.

**Common Lizard**Impacts of construction and operation

- 8.12.53 Common lizard has the potential to lose some habitat on the moorland section of the wind farm. Although the amount of direct habitat loss is small and the impact is considered to be of **low magnitude, long term** and of **minor significance**.
- 8.12.54 However, there is the potential that there could be negative impacts during construction of the proposed wind farm through the risk of injury due to site clearance works. If ground clearance takes place from early spring to late summer, there is the likelihood of disturbance to breeding habitat. If during autumn and winter, then there is the risk of disturbing hibernating animals. The impact is considered to be of **medium magnitude, short term** and of **moderate significance**.
- 8.12.55 It is likely that the negative impacts of the operating wind farm will be **negligible**.

**Migratory Salmonids**Impacts of construction and operation

- 8.12.56 As the development is proposed for above and adjacent to many of the watercourses containing migratory salmonids there is a possibility of a negative impact on the population due to silt and other water pollutants. Culverts and bridges can cause problems for fish trying to pass upstream and downstream. The effects of construction and operation have the possibility of being of **high magnitude, long term** and of **major significance**.

**Amphibians**Impacts of construction and operation

- 8.12.57 There will be a small loss of habitat for amphibians. If construction takes place during the spring or summer, there could potentially be an impact if there is silt run off into small ponds and construction on wetter areas of the moor. The effects of construction are considered to be of **low magnitude of minor significance**. The effects of the operational wind farm are considered **negligible**.

**Butterflies and moths**Impacts of construction and operation

- 8.12.58 The loss of habitat for feeding adults and caterpillars will be **negligible** and the effects of construction and operation are also considered to be **negligible**.

**Decommissioning Impacts**

- 8.12.59 Although difficult to anticipate the extent of impacts, which could result due to decommissioning of the site at this time, potential issues are likely to relate to disturbance associated with removal of turbines and turbine bases and other infrastructure. Given that the vehicles involved in decommissioning will be able to use the existing infrastructure it is unlikely that there will be further significant habitat loss. Impact on protected species is expected to be similar to that during construction, although slightly reduced.

**8.13 Mitigation**

- 8.13.1 A Habitat Management Plan (HMP) including a Species and Habitat Protection Plan has been written as part of a programme of mitigation measures associated with the construction and operation of the Scoop Hill Community Wind Farm. An Outline version of the HMP has been submitted in support of the S36 application. This will be designed to minimise any negative impacts on habitats and species. There is also the possibility of gaining a positive impact on the site through careful mitigation design to enhance existing retained habitats for notable species recorded on the site, which would assist the Local Authority/Scottish Government in discharging its biodiversity duty.
- 8.13.2 It is proposed that the HMP is a working document which will evolve following discussions between the developers, the landowners, the ECoW and organisations with responsibility for and an interest in key wildlife species such as the Biodiversity Officer, NatureScot, SEPA and the RSPB to develop an effective and workable plan for the site. The priority will be to:
- Examine ways to minimise disturbance and possible problems for key species;
  - Examine how the value might be improved by changes in land management; and
  - Increase overall biodiversity through management targeted at specific species.
- 8.13.3 A brief outline of mitigation for each habitat and species is provided below but will be covered in further detail in the Outline HMP.
- 8.13.4 An Ecological Clerk of Works (ECoW) will be employed to ensure compliance with planning regulations and ensure protection of habitats and wildlife.
- Habitats**
- 8.13.5 The locations for all infrastructure including turbine bases, tracks, borrow pits, site storage area and temporary construction compounds have already been chosen to reduce impact on the most important habitats and avoiding GWDTEs.
- 8.13.6 The Construction and Environmental Management Plan (CEMP) will include a constraints map detailing all GWDTEs. These will also be included in the SEPA Construction Site Licence with details on avoidance, or measures to greatly reduce negative impacts. Mitigation measures to ensure hydrological connectivity will include the following:

- Floating tracks;
  - Piping where necessary;
  - No settlement ponds or silt traps will be placed within GWDTE habitats;
  - Any pumping of turbine water will be within GB15 and will not be discharged directly on to GWDTE but discharged in a manner that allows it to flow back into the hydrological pathway;
  - Highly dependent GWDTE will be identified onsite and reviewed in detail by the ECoW when the Pollution Prevention Plan is being drafted to ensure that each is properly protected against potential changes to the water supply patterns around these GWDTEs;
  - All mitigation will be designed and identified in the PPP to the satisfaction of SEPA; and
  - Prior to construction, the footprint of the wind farm will be walked by the ECoW with the site engineer and the GWDTEs identified where civil works may impact upon them. Any alterations will be discussed with SEPA and any amendments made to the Construction Site Licence as required.
- 8.13.7 Improvements are likely to be possible by applying the micro-siting allowance of up to 100m enabling fine adjustments to be made in the field, with the ECoW able to confirm up to 50m and with 50m to 100m requiring approval from SEPA.
- 8.13.8 Robust surface water management measures including suitably sized attenuation ponds in groups of three, silt traps and silt nets will be put in place following good practice and these will be overseen by and agreed with the ECoW. All locations of the pollution prevention measures will be detailed in the SEPA Site Construction Licence.
- 8.13.9 Construction phase impacts resulting from pollution by fuels, oil, servicing chemicals and leaching from cement will be avoided by the adoption of best working practices, choice of the most appropriate cement mix and design of servicing areas.
- 8.13.10 During the construction period, the working area will be kept to a minimum to avoid unnecessary peripheral habitat disturbance and the accumulation of unnecessary amounts of loose material that might be washed away during periods of heavy rain.
- 8.13.11 Good practice will be followed to design an effective drainage system to allow proper distribution of water to down slope areas. Where cut tracks are used, these will have cross pipes inserted at suitable intervals to spread out the supply of water.
- 8.13.12 The outflow from cross drains will be carefully designed to vent diffusely, close to the ground, and will be positioned to avoid areas with silty or saturated soil.
- 8.13.13 Floating tracks will be used to traverse mire habitats, allowing water to pass underneath the track, or through its lower layers. They will also be used where peat depths are greater than 0.5m.
- 8.13.14 Where flush habitat has to be crossed, an additional lower layer design will be used with perforated pipes spaced over the width of the flush and set within a matrix of open graded free draining material wrapped in separator geotextile.
- 8.13.15 Regular inspections will be made to check whether the drainage systems remain operating as intended. This should ensure a proper supply of water for sensitive communities.
- 8.13.16 Best practice will be employed during and after deep excavations for turbines and borrow pits. Settling ponds will be used to store excess water accumulating in the excavation areas. Clean filtered water from the

settling ponds will be released in appropriate areas, maintaining water supply to downslope wetland communities.

- 8.13.17 Turves with vegetation representative of the site from excavation work will be stored for use in dressing the disturbed edges around the infrastructure. This will prevent the erosion of loose soil and colonisation by undesirable plant species.
- 8.13.18 Some of the habitat enhancement at Scoop Hill will focus on improving the condition of the upland habitat complex of heathland and mire. These habitats have been subject to management by burning and drainage for many years and heavily grazed, leading to a loss of diversity.
- 8.13.19 Habitat enhancement at Scoop Hill will also aim to improve the condition of the upland habitat mire complex. The habitats have been subject to much drainage and grazing for many years. Much blanket bog has been slowly converted to poorer quality dry modified bog. The dry modified bog has been identified as having the potential for recovery and it is anticipated that it would respond well to a programme of grip-blocking and a reduction in grazing pressure.
- 8.13.20 Where the topography is suitable, there is potential for increasing the value of the mire habitats by creating the conditions for basin mire during the restoration of borrow pits. Few examples of basin mire are currently found in the study area and the former borrow pits provide an opportunity to increase the number.
- 8.13.21 Habitat enhancement will also include the establishment of cleuch woodland. At present very little broadleaved woodland exists at the site. The biodiversity of the site would be improved for many species including black grouse, merlin, and songbird populations and would enrich the available habitat for ring ouzel, such as the habitat in the upper Dryfe Water valley.

### Species

#### Bats

- 8.13.22 To minimise the potential for disturbance to bats during the construction process, tree felling will be undertaken in winter or early spring when bats are less likely to be active. If any construction works are undertaken during the active season for bats, construction activities will be limited to daylight hours and no work is undertaken at dawn or dusk near to preferred foraging areas for bats. This would limit the potential for disturbance to bats by avoiding the need for night-time lighting on site, which could deter foraging around the site, but would also attract moths to the lights encouraging bats to feed around them.
- 8.13.23 To minimise the potential for collision, turbines will be placed a minimum distance of 50m from the tip of the turbine blade from the forest edges.
- 8.13.24 Broad-leaved tree and scrub planting within the cleughs and along watercourses away from turbine locations will enhance foraging opportunities. Bat boxes will be erected in suitable locations such as at farmhouses and in woodland distant from the turbines.
- 8.13.25 If the above recommendations are put in place, this would reduce the potential of disturbance and displacement and risk of collision on bats so that it is considered that a negative impact will be of a **low magnitude and of low significance**.



### Otters

- 8.13.26 A large amount of the access track generally avoids crossing watercourses. However where it is necessary to cross them, a pre-construction survey for otters will be carried out to determine the current status of otter on the site at that time and ensure that, if there has been any recent change in otter activity around the site, any necessary mitigation measures, which have been proposed, can be implemented where necessary.
- 8.13.27 The ECoW, in liaison with the construction engineers, will ensure the location of the access tracks and structures are more than 30m from a potential holt or lie-up (100m for a breeding holt), a strict precautionary method of working will be set in place by the ECoW. This may necessitate an application for a European Protected Species Licence (EPSL) from NatureScot prior to any works being carried out. However, it may also be possible to avoid any potential for disturbance to otters by careful timing of the works and sensitive working methods, depending on the proximity of the holt/lie up to the works, and thereby avoid the need for a licence.
- 8.13.28 Watercourse crossings have been identified in the Hydrology assessment (Section 10 of the EIAR, Technical Appendix 10.1). Should the access track require to be altered, any culverts or bridges will be designed with sufficient headroom to allow passage by otters along watercourses, including during spate conditions, and to maintain water quality and flow. This may necessitate the inclusion of ledges and diversionary fences to facilitate movement, however the specific design will be agreed with SEPA/NatureScot prior to construction.
- 8.13.29 Any scrub woodland or other dense vegetation, beside watercourses, will be retained to provide suitable cover for lie-up areas and facilitate movement of otters through the site. Site contractors will be informed of any sensitive areas to ensure no accidental disturbance to holts or resting places.
- 8.13.30 If culverts or piping are to be stored on site, these will be capped to avoid entrapment of otters inside. In addition, any excavations over 0.5m deep, such as turbine bases or borrow pits, will be covered over at night or ramped on one side to enable otters to escape if they fall in. Temporary fencing will also be installed around these excavations to avoid animals falling in.
- 8.13.31 Strict pollution prevention measures will be implemented to ensure no impacts on water quality, which could have indirect impacts on the otter population. These will include standard good practice measures to control silt levels, oil and fuel spills. Water monitoring and inspections will be carried out.
- 8.13.32 If all the above recommendations are put in place, it is considered that the impact of the construction of the wind farm is likely to be of a **low magnitude** and **not significant**. Enhancement measures for otter will also be implemented, including planting up riparian corridors within the cleughs with species such as willow, alder, ash, hazel, hawthorn and blackthorn to increase cover/refuge opportunities for this species. A number of attenuation ponds will be designed to be wildlife friendly and will be left on site for amphibians thus providing a food source for otters. If these enhancement measures are put in place it is probable that this may have a **positive** impact on otter within the Zone of Influence due to the additional cover facilitating movement through the site.

### Badgers

- 8.13.33 A pre-construction check will be made on the site to check existing setts and for any newly excavated setts, which could be impacted by the construction. If identified, a 30m buffer zone will be implemented around any setts to avoid any potential disturbance to badgers inside during the construction process. Disturbance will be avoided during the breeding season (December to June). These buffer zones will be set up by the

ECoW on site who will monitor badger use of the site during construction to further assess the disturbance impacts associated with construction and advise construction workers if any changes are necessary. Setts within 100m of a borrow pit will require a license from NatureScot and excavation of them will not take place during the period December to June. Exclusion of badgers from setts will not be considered unless it is really necessary.

- 8.13.34 Sources of seasonal food will be included in the HMP such as planting of fruit trees e.g. gean, elder, apple and plum.
- 8.13.35 The mitigation which has been recommended to avoid otters becoming trapped in piping or excavations on site during the construction process will also ensure the protection of badgers. It is therefore extremely unlikely that there would be a significant impact on badgers due to the construction of the proposed wind farm and negative impacts are considered to be **negligible**. Planting to improve foraging opportunities is likely to result in a **positive impact** on badgers.

### Red Squirrels

- 8.13.36 A pre-construction check will take place where all key-hole felling is due to take place to check for dreys. To reduce the impact on breeding squirrels, all felling will take place out with the breeding season. No broad-leaved tree planting will take place within the forest as this may attract grey squirrels. Adverse impacts are considered to be of **low magnitude, temporary** and **minor significance**.

### Pine Marten

- 8.13.37 A pre-construction check will take place where all felling is to take place to check for pine marten dens. To reduce the impact on breeding animals, all felling will take place out with the breeding season. Pine marten denning boxes will be erected, and this will be out with the conifer plantation in areas of broad-leaved woodland in order that they are more likely to prey upon grey squirrels rather than red. Adverse impacts are considered to be of **low magnitude, temporary** and **minor significance**.

### Migratory salmonids, lampreys and eels

- 8.13.38 Robust surface water management measures will be put in place following good practice and overseen by the ECoW. Water quality monitoring will take place. All infrastructure will be located a minimum of 50 m from any watercourse. Culverts and bridges will be designed to allow fish passage at all times and their construction agreed with the ECoW and the River Annan District Salmon Fishery Board. With these measures in place the impact can be reduced to a **low magnitude, short term**, possibly even **negligible** and **not significant**.

### Reptiles

- 8.13.39 Carrying out ground clearance out with the spring and summer months will minimise disturbance to reptiles. However, there is the possibility of disturbing hibernating reptiles. Any suitable hibernaculum's that require to be removed for construction such as stone walls will be de-constructed in July (post breeding and prior to hibernation). This will be overseen by the ECoW. New hibernaculum's will be constructed on site on moorland. With these measures in place, the negative impact can be reduced to **negligible** with some **positive effects**.

### Amphibians

- 8.13.40 As with reptiles, avoiding ground clearance in spring and summer will minimise disturbance to amphibians.
- 8.13.41 Strict pollution prevention measures during construction will minimise the risk of pollution to wet areas and ponds.
- 8.13.42 Habitat enhancement will also take place including creation of wildlife friendly attenuation ponds for construction which will be left on site following completion of construction. With these measures in place, the negative impact can be reduced to **negligible** with some **positive effects**.

### Decommissioning Impacts

- 8.13.43 If the recommendations given above to avoid significant impacts on habitats and species during construction of the wind farm are also implemented during the decommissioning phase, it is probable that there would be **no significant impacts** during decommissioning of the wind farm site. However, this would need to be re-assessed at a later stage taking into consideration the actual status of species and habitats present on the wind farm site at that time.

### Residual Effects

- 8.13.44 Residual effects following mitigation are summarised in Appendix 8.23. Following mitigation, negative impacts on habitats will be of varying magnitudes but the majority can be considered to be of a **low magnitude**, possibly even **negligible, temporary** and **not significant**.
- 8.13.45 GWDTEs can be avoided and mitigated for and the adverse impacts are also considered to be of a **low magnitude**, possibly even **negligible, temporary** and **not significant**.
- 8.13.46 The impact on bats during construction is considered to be of low magnitude and minor significance and of medium magnitude, long term and moderate significance. However, if good practice is followed and mitigation put in place, this can be reduced to **low magnitude** and of **minor significance** with the potential for some **positive** impact.
- 8.13.47 There is potential for otters to be adversely affected during construction. However, with strict pollution measures in place and mitigation the effects can be reduced to **negligible**.
- 8.13.48 If good practice is followed and mitigation put in place, the development is extremely unlikely to have a significant negative impact on badgers. There are opportunities for positive impact through improving foraging opportunities.
- 8.13.49 By covering excavations whilst not in use, the impact on deer will be **negligible**.
- 8.13.50 Potential adverse effects on common lizard are **negligible** with some **positive effects**.
- 8.13.51 The effects of construction and operation have the possibility of being of **high magnitude, long term** and of **major significance** for migratory salmonids. With strict pollution control the effects can be reduced to **low magnitude** of **minor significance** and **temporary**.
- 8.13.52 With mitigation, the site will provide **positive** benefits for amphibians.

- 8.13.53 Off-site habitat enhancements will provide **positive** benefits for butterflies and other invertebrates.
- 8.13.54 With mitigation at Scoop Hill, the residual effect on habitats and species is considered to be of **low magnitude** and of **minor significance**.

### Assessment of Cumulative Residual Effects

- 8.13.55 The primary concern regarding the assessment of cumulative effects is to identify situations where the effects on habitats and species although acceptable at an individual development may be more significant if combined with adjacent developments. There are a number of other developments within the Natural Heritage Zone.
- 8.13.56 There are a number of other developments in the area, which need to be considered in terms of cumulative impacts. These include operational, consented/under construction and wind farm applications currently going through the planning process. A list of developments within 20km falling within the Natural Heritage Zone and adjacent NHZ are detailed in Appendix 8.22.
- 8.13.57 There are potentially 12 wind farms within the NHZ and adjacent Border Hills NHZ. Many of these have similar habitats and species.
- 8.13.58 Table 8.10 outlines the impacts on habitats and species at a number of adjacent wind farms within 20km of Scoop Hill for which EIAs were available.

**Table 8.10 - Cumulative Impacts of Wind Farms and other Developments within the NHZ**

Development	Predicted Impacts on habitats and species
Hopsrig	No significant residual effects associated with the Proposed Development, during construction, operation, and decommissioning of the Proposed Development on habitats or bats
Minnygap	The operation of the wind farm was not predicted to give rise to any significant impacts on habitats or species.
Ewehill and Extension	Habitats mainly wet modified bog and marshy grassland, no significant impact. No significant impact on otter holts or bats. No long term impacts to any protected species.
Harestanes	Following implementation of mitigation measures, no residual significant negative effects were predicted on habitats or protected species
Clyde	Negligible impact on bog habitats. Impacts on otters, badgers, red squirrels, common lizard, adder, and brown trout all predicted to be low.
Clyde Extension	No significant residual effect on blanket bog. A cumulative assessment predicted no significant effects on ecology.
Solwaybank	Short term effects predicted for badger, red squirrel, low potential collision risk for bats, some loss of bog habitats.
Crossdykes	Minor loss of bog habitats. No significant effect on bats, otters, badgers, sea trout or salmon.
Loganhead	Most habitat loss is commercial forestry; other habitat loss is low and not significant. Development not considered a threat to otters, bats, badgers or red squirrel.
Earlshaugh	Effect on otters negligible, mitigation measures to reduce impacts on blanket bog habitat and fish, and effect on herptiles negligible.
Faw Side	Loss of bog habitat, no significant impact on badgers, otters, red squirrels or migratory fish. Predicted significant impacts on bats at a study area level as

	low population and limited bat activity.
Whitelaw Brae	Otters required a species protection plan, negligible effects on badger, red squirrel, bats, reptiles and fish.

- 8.13.59 The various adjacent wind farms within the NHZ will mean a cumulative loss of a variety of habitats. There will be varying amounts of loss of several of the habitats of national value across all these sites. However, the majority of the EIAs conclude no or minor significant impacts to habitats. With mitigation at Scoop Hill, the cumulative residual effect is therefore considered to be of **low magnitude** and of **minor significance**.
- 8.13.60 With regard to species, these additional developments, together with the proposed wind farm are likely to result in some negative impacts due to additional direct loss of habitat suitable for foraging and refuge for the wildlife, which has been recorded in the area, as well as negative impacts due to higher levels of disturbance/displacement over a much wider area. However, as the Scoop Hill Wind Farm proposal would not appear to have a significant negative effect on species of conservation concern, the cumulative impact is considered to be of **low magnitude** and of **minor significance**.

#### 8.14 Statement of Significance Summary

- 8.14.1 The scope of the ecological assessment was determined through a combination of desk study, fieldwork, consultation and analysis of the combined data. Fieldwork included a Phase 1 habitat survey, NVC survey and field assessment for protected species.
- 8.14.2 It is considered that the development of the wind farm was likely to have only a few negative impacts on the habitats of the site including loss of blanket bog, drying of bog habitats and potential water pollution. However, a series of measures are described to minimise the impact on habitats and the HMP includes compensatory measures, thus ensuring that the negative impacts are generally of low magnitude, of low significance or negligible.
- 8.14.3 Positive effects can also be achieved including bog restoration, native tree planting and enhancements for many species including otter, badger, pine marten, amphibians and reptiles.
- 8.14.4 Whilst there is potential to disturb and displace various protected species including bats, otters, badgers and reptiles, care has been taken to avoid disturbance of these protected species. Any potential negative impacts have been mitigated for and it will be possible to comply fully with wildlife protection legislation.

**Appendix 8.1 — Bat Activity Transect Routes**

Transect Number	Survey area	Route
1	Gillesbie	Walk-round survey of open farmland and rough grazing (semi-improved acid grassland with some moorland relics), in southern part of the site (around Gillesbie Hill, Loft Shaws and Peat Hill).
2	Laverhay Height	Walk-round survey of open moorland and blanket bog, starting at upper limit of improved pasture near Laverhay Farm, including Milne Height, Heatherybrae Head and Laverhay Height, ending along the edge of the Laverhay Forest conifer plantation.
3	Dundoran and Broadfield Height	Walk-round survey commencing in western part of the site at Dundoran Plantation (fairly mature coniferous trees) and out over rough grazing/moorland edge on Broadfield Height descending to improved pasture above Leithenhall Farm.
4	Black Hill, Rue Gill Hill and Dryfe Water	Walk-round survey along varied age coniferous plantation at Black Hill then out over heather moorland on Ruegill Hill, down to and along edge of gully (Duncan's Cleuch) then along estate track (edged by immature broadleaved trees and scrub) to Dryfehead Bothy. (NB Original design of route (circular route from Dryfehead Bothy out onto Peat Rig and over Ruegill Hill then back to bothy via Duncan's Cleuch) was changed for the sake of health and safety (heath and bog habitat with metre-deep grips on Peat Rig is too dangerous to cross in poor light)).
5	Three Mullach Hill	Follows forestry access tracks around Three Mullach Hill and ridge to the west of Finniegill Burn, using both drive-round survey on solid tracks and walk-round on shorter sections through northern part. Samples a variety of forestry habitats: track-edges, clear-fell, clear-fell/re-plant and young conifer plantation (mostly recently established but with a few more mature sections, one since felled).
6	Silton Forest	Mainly drive-round survey of Silton Forest, using forestry access tracks through mainly pre-felling age plantation blocks, crossing Dryfe Water in two places, along the edge of one un-planted blanket bog relic; this route was occasionally divided up between drive-round survey and walk-round survey depending on logistics/to suit practical considerations.

**Appendix 8.2 — Bat Transect Survey Dates, Times and Weather**

Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
<b>Gillesbie</b>					
1	15/05/2018	21.00	23.50	Start temp: 10.9°C; end temp: 9.7°C; cloud cover 100%; wind at start WNW 2-3, at end NNW 3; no precipitation	Alan Wood Dougie Irving
1	25/06/2018	22.06	00.55	Temp 15°C; cloud cover 60%; wind 0-1; no precipitation	Jamie Manners Liam Flynn
1	09/08/2018	20.15	23.30	Temp 13°C; cloud cover 80%; wind 0-1; no precipitation	Jamie Manners Diane Lyons
1	15/10/2018	18.20	20.35	Start temp: 10°C; end temp: 7°C; Start temp: 10°C; end temp: 7°C; wind: 2E; cloud cover 10% at start, 90% at finish; dry at start, intermittent light rain from 19.30 on	Jamie Manners Davy Galbraith
<b>Laverhay</b>					
2	14/05/2018	21.25	00.20	Start temp: 11°C; end temp 9.8°C; cloud cover: 0%; wind: SSW 1; no precipitation	Jamie Manners Alan Wood
2	12/07/2018	21.54	00.30	Start temp: 16°C; end temp: 10°C; wind at start: 0-1, no direction, at end N 2; cloud cover 0%; no precipitation	Liam Flynn Davy Galbraith
2	09/08/2018	20.28	23.15	Start temp: 13.5°C; end temp: 11.5°C; cloud cover 95% at start, 40% at end; brief shower at start, c20.28	Liam Flynn Davy Galbraith
2	15/10/2018	18.05	20.21	Start temp: 8°C; end temp 6°C; cloud cover 5%; wind: 2 E; no precipitation	Alan Wood Seumas Harris
<b>Dundoran</b>					
3	14/05/2018	21.00	00.15	Start temp 12°C; end temp 9.5°C; wind at start 0, no direction, at end NE1; no precipitation	Dougie Irving Davy Galbraith
3	12/06/2018	21.56	00.22	Start temp: 11.5°C; end temp: 9°C; cloud cover 10%; wind at start W1, at end W0-	Jamie Manners Alan Wood

Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
				1; no precipitation	
Transects cancelled due to turbines being withdrawn from the scheme					
<b>Rue Gill Hill</b>					
4	17/05/2018	21.15	00.00	Start temp: 14°C; end temp 11°C; cloud cover 75%; wind NE 0-1; no precipitation	Liz Parsons Jamie Manners
4	04/06/2018	21.47	00.22	Start temp: 14°C; end temp: 9°C; cloud cover 100% at start, 100% at end; wind at start 0, no direction, at end NE 1; no precipitation	Dougie Irving Davy Galbraith
4	26/06/2018	22.25	00:10	Start temp: 18°C; end temp 15°C; wind at start SE 1, at end S E2; cloud cover 40%; no precipitation	Liam Flynn Alan Wood
4	25/07/2018	21.15	23:30	Start temp: 14.5°C; temp at end: 10°C; wind at start NE 0-1, at end NE 1; cloud cover 25%; no precipitation	Jamie Manners Liam Flynn
4	27/08/2018	20.30	22.55	Start temp: 12°C; end temp: 10°C; wind at start 0-1, no direction, at end NE 1-2; no precipitation	Karen McCaul Jamie Manners
<b>Three Mullach Hill</b>					
5	17/05/2018	21.15	00.15	Start temp: 14°C; end temp 10°C; cloud cover 25%; wind at start S 0-1, at end NE 0-1; no precipitation	Diane Lyons Liam Flynn
5	04/06/2018	21.45	24:00	Start temp not given; end temp not given; cloud cover 100%; wind at start NE 0-1, at end NE 1; no precipitation	Alan Wood Jamie Manners
5	26/06/2018	22.29	00.30	Start temp: 18.5°C; end temp 17.2°C; wind at start SE 1, at end S E2; cloud cover 30%; no precipitation	Jamie Manners Davy Galbraith
5	27/08/2018	20.52	22.35	Start temp: 12°C; end temp: 10°C; wind at start 0-1, no direction, at end NE 1-2; cloud cover 50%; no precipitation	Alan Wood Davy Galbraith



Transect	Date	Start Time (hrs)	End Time (hrs)	Weather	Surveyors
5	02/10/2018	18.50	21.25	Start temp: 10°C; end temp: 7°C; wind at start NW 2, at start NW 2, at end NW 2; cloud cover 50%; no precipitation	Liam Flynn Davy Galbraith
Silton Forest					
6	15/05/2018	21.15	23.32	Temp at start: 12.5°C; temp at end: 11.1°C; wind at start W 0-1, at end W 1-2; cloud cover 100%; no precipitation	Jamie Manners Davy Galbraith
6	11/07/2018	02.44	04.47	Temp at start: 14°C; temp at end: 9°; wind at start 0-1, no direction, at end NE 1-2; cloud cover 30%; no precipitation	Liam Flynn Davy Galbraith
6	11/07/2018	02:48	04:48	Temp at start: 11°C; temp at end: 9°; wind at start 0, no direction, at end NE 1; cloud cover 25%; no precipitation	Jamie Manners Alan Wood
6	25/07/2018	21.24	22.46	Temp at start: 14.5°C; temp at end: 10°C; wind at start NE 0-1, at end NE 1; cloud cover 20%; no precipitation	John Speirs Davy Galbraith
6	02/10/2018	18.56	21.05	Temp at start: 9°C; temp at end: 7°C; NW 2; cloud cover 30%; no precipitation	Jamie Manners Alan Wood
6	02/10/2018	18.50	21.30	Temp at start: 10°C; temp at end: 7°C; wind at start NW 2, at end NW 2; cloud cover 50%; no precipitation	Liam Flynn Davy Galbraith

**Appendix 8.3 – Locations of Static Recorders, Dates and Times**

Detector Number	Location	Dates	Recording times
<b>Cluster 1 Dundoran</b>			
1	NY 12622 98175 (on edge of older spruce stand adjacent to ride and younger stand)	30/05/2018 to 04/06/2018	21.10 to 05.10
2	NY 12590 99544 (on fencepost at wall junction west of Burnt Mound)		
3	NY 13091 99534 (on wall on Broadfield Height)		
4	NT 12687 00643 (SE of cairn on Craig Fell)		
<b>Cluster 2 Gillesbie</b>			
<b>Spring 2018</b>			
1	NY 15427 94976 (on snag within Tilhill clearfell/re-plant on Gudewife's Hill)	05/06/2018 to 12/06/2018	21.18 to 05.18
2	NY 15978 95178 (on upright branch of fallen tree beside Sembletree Burn)		
3	NY 16187 93680 (at north east corner of new plantation on lower slopes of Gillesbie Hill)		
4	NY 15768 93423 (on birch tree at edge of former conifer plantation)		
<b>Summer 2018</b>			
1	NY 15427 94976	25/07/2018 to 01/08/2018	20.45 to 05.45
2	NY 15978 95178		
3	NY 16187 93680		
4	NY 15768 93423		
<b>Autumn 2018</b>			
1	NY 15427 94976	02/09/2018 to 07/09/2018	
2	NY 15978 95178		
3	NY 16187 93680		
4	NY 15768 93423		
<b>Cluster 3 Ramshaw</b>			
<b>Spring 2018</b>			
1	NY 16069 97123 (on dead snag on Ramshaw Rig in young replant after clearfell)	21/05/2018 to 29/05/2018	20.57 to 05.15
2	NT 16617 00871 (on tree-trunk on western slopes above Dryfe Water)		
3	NT 16152 00903 (on young spruce at turning circle on Rue Gill Hill)		

4	NY 17317 97586 (on tall spruce on eastern slopes above Dryfe Water)		
<b>Summer 2018</b>			
1	NY 17317 97586 (on tall spruce on eastern slopes above Dryfe Water)	16/07/2018 to 24/07/2018	20:35 to 05:35
2	NT 16152 00903 (on young spruce at turning circle on Rue Gill Hill)		
3	NT 16617 00871 (on tree-trunk on western slopes above Dryfe Water)		
4	NY 16069 97123 (on dead snag on Ramshaw Rig in young replant after clearfell)		
<b>Autumn 2018</b>			
1	NY 17317 97586	03/10/2018 to 15/10/2018	18:10 to 07:50
2	NT 16152 00903		
3	NT 16617 00871		
4	NY 16069 97123		
<b>Cluster 4 Silton</b>			
<b>Spring 2018</b>			
1	NY 19227 95550 (beside forestry track on snedded tree)	14/05/2018 to 18/05/2018	20:40 to 05:30
2	NY 19129 95121 (in clearing behind stalkers' shed on ash tree)		
3	NY 18056 96248 (on willow at edge with conifer plantation and blanket bog relic)		
4	NY 17141 96048 (on conifer at plantation edge along main forestry track)		
<b>Summer 2018</b>			
1	NY 19129 95121	13/06/2018 to 18/06/2018	21:30 to 05:30
2	NY 19227 95550		
3	NY 18056 96248		
4	NY 17141 96048		
<b>Autumn 2018</b>			
1	NY 19129 95121 (in clearing behind stalkers' shed on ash tree)	27/08/2018 to 07/09/2018	19.18 to 07.18
2	NY 19227 95550 (beside forestry track on snedded tree)		
3	NY 18056 96248		
4	NY 17141 96048		
<b>Cluster 5 South Loch Fell (2019)</b>			

Spring 2019			
1	NT 17196 03578 (On post on Dun Moss)	27/06/2019 to 06/07/2019	21:28 to 04:53 (SM2+)
2	NT 17252 03063 (At southern end of South Loch Fell on post)		
Summer 2019			
1	On post on Dun Moss	16/07/2019 to 27/07/2019	21:00 to 05:30 (SM2+)
2	NT 17252 03063 (At southern end of South Loch Fell on post)		
Cluster 6 Three Mullach Hill (2019)			
Spring 2019			
1	NY 16675 97877 (on dead snag in clearfell/recent re-plant)	16/04/2019 to 26/04/2019	19.00 to 08.30 (SM2+)
2	NY 16862 97261 (on snag in recent clearfell/re-plant)		
3	NY 16978 97477 (Beside forest track on branch)		
4	NY 16614 97416 (beside track, clearfell)		
August 2019			AudioMoth run
1	NY 16675 97877	21/08/2019 to 31/08/2019	19:40 to 06:35 (AudioMoth)
2	NY 16862 97261		
3	NY 16978 97477		
4	NY 16614 97416		
September 2019			SM2+ run
1	NY 16675 97877	10/09/2019 to 20/09/2019	19:15 to 07:10
2	NY 16862 97261		
3	NY 16978 97477		
4	NY 16614 97416		

**Appendix 8.4 – Badger Sett Definitions**

<b>Sett Type</b>	<b>Definition</b>
Main	Several holes with large spoil heaps and obvious paths emanating from and between sett entrances.
Annexe	Normally less than 150 m from main sett, comprising several holes. May not be in use all the time, even if main sett is very active.
Subsidiary	Usually at least 50 m from main sett with no obvious paths connecting to other setts. May only be used intermittently.
Outlier	Little spoil outside holes. No obvious paths connecting to other setts and only used sporadically. May be used by foxes and rabbits.

**Appendix 8.5 – Fish Survey Locations**

Watercourse	Site code	Tributary	Easting	Northing	Altitude (m)
Dryfe Water	De0.5	Duncan's Cleugh	316585	601385	357
	De3		317050	599900	300
	De4		317221	598310	270
	DESI1	Stoney Gill	317172	596673	256
	DE7		317180	596644	254
	DeCe1	Capel Burn	317175	594684	207
	De8		317257	594658	206
	De9		318610	593994	203
Wamphray Water	Wy0.5		314912	601326	225
	WY1		313875	599125	170
	Wy6		313610	597190	152
	Wy7		313400	596880	152
	Wy2		312939	596526	131
	Wy8		311900	596200	117
	Wy3		311900	596200	89
	Wy4		311169	595618	75
	Wy5		310959	595359	73



## Appendix 8.6 – Designated Sites within 20 km of Scoop Hill Wind Farm

## Statutory Sites

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
<b>European Designated Sites</b>			
River Tweed SAC	1.6km to the north	Biological: River Lamprey <i>Lampetra fluviatilis</i> , Brook Lamprey <i>Lampetra planeri</i> , Otter <i>Lutra lutra</i> , Sea Lamprey <i>Petromyzon marinus</i> , Atlantic Salmon <i>Salmo salar</i> , Watercourses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation/Rivers with floating vegetation often dominated by water-crowfoot.	No direct habitat connections No potential for impacts.
Moffat Hills SAC	5.6km to the north	Biological: Alpine and subalpine heaths, blanket bog, and plants in crevices on base-rich rocks, dry heaths, tall herb communities, montane acid grasslands, plants in crevices on acid rocks, acidic scree.	No direct habitat connections No potential for impacts.
Langhom-Newcastleton Hills SPA	15.4km to the east	Supports a breeding population of European importance of Annex 1 species Hen Harrier <i>Circus cyaneus</i> .	No direct habitat connections No potential for impacts.
<b>National Designated Sites</b>			
Lochwood SSSI	1.4km to the west	Biological: Wood pasture and parkland, purple hairstreak ( <i>Neozephyrus quercus</i> , lichen assemblage), Lochmaben Lochs SSSI (Biological: Eutrophic loch, open water transition fen, beetle assemblage, fly assemblage).	No direct habitat connections No potential for impacts.
Lochmaben Lochs SSSI	12.3km to south west	Biological: Eutrophic loch, Open water transition fen, Beetle assemblage, Fly assemblage.	No direct habitat connections No potential for impacts.
Castle Loch SSSI	13.7km	Biological: Goosander <i>Mergus merganser</i> , Greylag Goose <i>Anser anser</i> , Pink-footed Goose <i>Anser</i>	No direct habitat connections No potential for impacts.

		<i>brachyrhynchus</i> .	
Shiel Dodd SSSI	12.9km to the west	Biological: Upland assemblage including blanket bog, subalpine dry dwarf-shrub heath, and calcareous types of spring-head, rill and flush.	No direct habitat connections. No potential for impacts.
Perchhall Loch SSSI	6.7km to south west	Biological: Basin fen and beetles.	No direct habitat connections. No potential for impacts.
Black Loch SSSI	14.2km to south west	Biological: Basin fen.	No direct habitat connections. No potential for impacts.
Dryfe Water SSSI	At edge of 500m around turbines and within the developable site	Biological: Upland mixed ash woodland	Potential for some impact on site margins.
Locharbriggs Quarry SSSI to the south west	19.5km	Geological: Fossilised wind-blown sand dunes of Permian Triassic age.	No potential for impacts.
Bigholms Burn SSSI to the south east	16.8km	Geological: Quaternary Geology and Geomorphology: Quaternary of Scotland.	No potential for impacts.
Tweedsmuir Hills SSSI	15.6km to the north	Biological: Upland habitats, Upland assemblage, Vascular plants, Vascular plant assemblage, Bryophyte assemblage, Non-vascular plants, Birds, Breeding bird assemblage.	No direct habitat connections No potential for impacts.
Craigdilly SSSI	15.7km to the north	Biological: Sub-montane scrub.	No direct habitat connections No potential for impacts.
Kingside Loch SSSI	18.3km to north east	Biological: Basin fen-schwingoor type, Bryophyte assemblage, Oligotrophic loch.	No direct habitat connections No potential for impacts.

**Non-statutory Sites within 20km (representative sample for Ancient Woodland and Long-established Woodland sites, WDSB = Within developable site boundary)**

Site Name and Designation	Distance from Site	Reasons for Designation	Potential for Impacts
<b>Listed Wildlife Sites</b>			
None			
<b>Local Nature Reserves</b>			
Castle and Hightae Lochs	13.7km	(Containing Castle Loch SSSI) Open water and birds, woodland.	No direct habitat connections. No potential for impacts.
<b>Ancient woodland/Long-established woodland sites</b>		There are over 700 areas of these woodlands within 20km to the west and south of the site. A small sample is provided of those within the developable site and up to 3km outside the site boundary	
Un-named riparian woodland of Wamphray Water	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Other (on Roy map).	No potential for impacts.
Milne Wood	WDSB	Ancient (of semi-natural origin).	No potential for impacts.
Un-named riparian woodland of Wamphray Water	WDSB	Other (on Roy map).	No potential for impacts.
LONG PLANTATION	WDSB	Small potential for impacts.	No potential for impacts.
Un-named	Adjacent	Ancient (of semi-natural origin).	No potential for impacts.
WHATE PLANTATION	0.2km	Long-Established (of plantation origin).	No potential for impacts.
The Pinnacle	WDSB	Long-Established (of plantation origin).	No potential for impacts.
Blaze Plantation	143m	Long-Established (of plantation origin).	No potential for impacts.
Oakrig Plantation	940m	Long-Established (of plantation origin).	No potential for impacts.
Whinny Plantation	WDSB	Long-Established (of plantation origin).	No potential for impacts.
Beldcraig Wood	Adjacent	Long-Established (of plantation	No potential for impacts.

		origin).	
Elf Knowe	252m	Long-Established (of plantation origin).	No potential for impacts.
<b>Other sites</b>			
Eskdalemuir Red Squirrel Priority Woodland	Overlaps site	Priority Area for Red Squirrel Conservation.	Potential for impacts.

## Appendix 8.7 – Desktop Results Habitats and Species

Common Name	Source	Location and distance from development
<b>LICHENS</b>		
<i>Lobaria pulmonaria</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta fuliginosa</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta limbata</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta sylvatica</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Sticta sylvatica</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Nephroma laevigatum</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<i>Parmeliella triptophylla</i>	SWSEIC	Dryfe Water/Macmaw, adjacent to site.
<b>PLANT SPECIES</b>		
Juniper <i>Juniperus communis</i>	SWSEIC RADSFB	Silton Forest, within site River Annan, adjacent to location of access track.
<b>MAMMALS</b>		
Red Squirrel <i>Sciurus vulgaris</i>	SWSEIC RADSFB	Silton Forest, within site.
Pine Marten	Fountain Forestry, David Smith, pers comm	Silton Forest, within site.
Badger	SWSEIC Ewan Braid, pers comm Philip Roskell, pers comm	Dundoran Plantation, within site. Broadfield Height, within site. Laverhay Sclanders, within site.
Common Pipistrelle <i>Pipistrellus</i>	SWSEIC	Greengate Head, near Black Esk valley, c500m outside site to east.
Pipistrelle roost	SWSEIC	Black Esk, c500m east of site boundary.
Pipistrelle roost	Finniegill owner	Finniegill, within area encompassed by windfarm, but outside of developable site.
Red Deer <i>Cervus elaphus</i>	SWSEIC	Laverhay Sclanders and Dryfe Water valley, within site.
Sika Deer <i>Capreolus capreolus</i>	SWSEIC	Adjacent to site, on the east side of Silton Forest.
Eurasian Pygmy Shrew	SWSEIC	In area adjacent to north west corner of site.
Eurasian Common Shrew	SWSEIC	In area adjacent to north west corner of site.
<b>INVERTEBRATES</b>		
Small Pearl-bordered Fritillary <i>Boloria selene</i>	SWSEIC	Silton Forest, within site.
Small Heath Butterfly <i>Coenonympha pamphylus</i>	SWSEIC	Silton Forest, within site and other broad locations at margins of the windfarm site.
<b>FISH</b>		
Atlantic Salmon <i>Salmo salar</i>	SWSEIC RADSFB	Black Esk, c500m east of site boundary River Annan, adjacent to location of access track.
Brown/Sea <i>Salmo trutta</i>	SWSEIC	Black Esk, c500m east of site boundary.
European Eel <i>Anguilla anguilla</i>	SWSEIC	Black Esk, c500m east of site boundary.
Chub <i>Leuciscus cephalus</i>	RADSFB	River Annan, adjacent to location of access

		track.
Pike <i>Esox lucius</i>	RADSFB	River Annan, adjacent to location of access track.
Brook Lamprey <i>Lampetra planeri</i>	RADSFB	River Annan, adjacent to location of access track.
Flounder <i>Platichthys flesus</i>	RADSFB	River Annan, adjacent to location of access track.
Perch <i>Perca fluviatilis</i>	RADSFB	River Annan, adjacent to location of access track.
Three-spined stickleback <i>Gasterosteus aculeatus</i>	RADSFB	River Annan, adjacent to location of access track.
Minnnow <i>Phoxinus phoxinus</i>	RADSFB	River Annan, adjacent to location of access track.
Grayling <i>Thymallus thymallus</i>	RADSFB	River Annan, adjacent to location of access track.
Bream <i>Abramis brama</i>	RADSFB	River Annan, adjacent to location of access track.
Carp <i>Cyprinus carpio</i>	RADSFB	River Annan, adjacent to location of access track.
Roach <i>Rutilus rutilus</i>	RADSFB	River Annan, adjacent to location of access track.
Bullhead <i>Cottus gobio</i>	RADSFB	River Annan, adjacent to location of access track.
<b>REPTILES AND AMPHIBIANS</b>		
Common Lizard <i>Zootoca vivipara</i>	SWSEIC	Gallatae, within windfarm area.
Slow-worm <i>Anguis fragilis</i>	SWSEIC	Near Dryfehead Bothy, within windfarm area.

## Appendix 8.8 – NVC Descriptions

The following NVC communities were identified on the survey site as either communities in their own right or as components in intermediate communities. Site-specific descriptions of the vegetation and species occurring in each community can be found in Section 8.9 Phase 1 Habitat survey and NVC Communities Survey. Further details of the vegetation at individual locations can be found in the extensive target notes.

### W1 *Salix cinerea-Galium palustre* woodland

NVC W1 woodland is found mainly in the lowlands along the margins of watercourses and in wet hollows. The canopy is usually dominated by *Salix cinerea* with occasional associates such as *Betula pubescens* or *Alnus glutinosa*. *Galium palustre*, *Juncus effusus* and *Mentha aquatica* are the most common field layer species. There can be other scattered wetland plants such as *Angelica sylvestris*, *Filipendula ulmaria*, *Equisetum fluviatile* and *Caltha palustris*.

### 'WSx' (Willow scrub woodland)

The code 'WSx' has been used in the NVC survey report and on the maps to indicate small patches of willow-dominated vegetation that is not referable to NVC W1 above. The small areas can have mixtures of willow species where *Salix cinerea*, *Salix aurita* and *Salix caprea* have colonised drier soils. There are several scraps of such vegetation scattered alongside some of the forestry tracks and on dry embankments. The field layer is variable, with some weedy vegetation and grasses such as *Holcus lanatus* or *Deschampsia cespitosa*. *Juncus effusus* and *Rubus fruticosus* can be frequent.

### W7 *Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum* woodland

*Alnus glutinosa* is usually the most abundant canopy species in the wet woodland NVC W7, with occasional *Fraxinus excelsior* or *Betula pubescens*. Understorey species depend on the dampness of the soils. *Crataegus monogyna* and *Corylus avellana* commonly occur on drier soils, while on damper ground *Salix cinerea* is often found. *Lysimachia nemorum*, *Filipendula ulmaria*, *Urtica dioica*, *Athyrium filix-femina*, *Chyrsosplenium oppositifolium*, *Holcus mollis* and *Poa trivialis* are common in the field layer.

### W9 *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland

NVC W9 is a community found on somewhat base-rich soils. The canopy is made up of mixtures of *Fraxinus excelsior*, *Ulmus glabra*, *Sorbus aucuparia* and *Betula pubescens*, often with *Corylus avellana*. Typical field layer species can include *Mercurialis perennis*, *Urtica dioica*, *Viola riviniana*, *Primula vulgaris* and *Geum urbanum*. Dryopterid ferns can be prominent.

### W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland

This is a dry type of woodland where the canopy consists mainly of Sessile Oak *Quercus petraea* and Downy Birch *Betula pubescens* often with some Rowan *Sorbus aucuparia*. Hazel *Corylus avellana* and Holly *Ilex aquifolium* can be common in an understorey layer. The field layer is usually grassy, though sometimes ferns are prominent, mainly *Pteridium aquilinum*. Common grasses are Common Bent *Agrostis capillaris*, Creeping Soft-grass *Holcus mollis* and Sweet Vernal-grass *Anthoxanthum odoratum*. Bryophytes can be abundant. Feathermosses are usually prominent, such as *Thuidium tamariscinum*, *Rhytidadelphus squarrosus* and *Hylocomium splendens*.

### W21 *Crataegus monogyna-Hedera helix* scrub

The main scrub species in NVC W21 is usually *Crataegus monogyna* but *Prunus spinosa* can also be common and can dominate in some stands. There is often *Rubus fruticosus* and *Rosa* spp. There is frequently a carpet of *Hedera helix* underneath the scrub species. *Galium aparine*, *Urtica dioica* and *Mercurialis perennis* are common associates.

### W23 *Ulex europaeus-Rubus fruticosus* scrub

*Ulex europaeus* or *Cytisus scoparius* dominates in NVC 23. *Rubus fruticosus* is the most common underscrub associate and sometimes there is some *Rubus idaeus* or *Pteridium aquilinum*. The field layer often contains typical species from acid grassland such as *Agrostis capillaris*, *Galium saxatile* and *Potentilla erecta*. Other variants include weedy elements with species such as *Senecio jacobaea* or have a rank grassland field layer with species such as *Arrhenatherum elatius*.

### M2 *Sphagnum cuspidatum/fallax* bog pool community

NVC M2 is a community of bog pools, wet hollows, soakways and seepage lines. *Sphagnum fallax* and *Sphagnum cuspidatum* account for most of the vegetation, accompanied by other bog species such as *Sphagnum papillosum*, *Erica tetralix*, *Eriophorum* spp and other sedge species.

### M4 *Carex rostrata-Sphagnum fallax* mire

*Carex rostrata* dominates this NVC community. It is accompanied sparsely by a few other vascular species that include *Potentilla erecta*, *Agrostis canina* and various sedges. The bryophyte layer often includes *Sphagnum denticulatum*, *Sphagnum papillosum*, *Sphagnum palustre* and *Polytrichum commune* as well as the constant *Sphagnum fallax*.

### M6 *Carex echinata-Sphagnum fallax/denticulatum* mire

NVC M6 mire is common throughout the survey area. Most examples belong to either the *Juncus acutiflorus* sub-community M6d, dominated by *Juncus acutiflorus*, or sub-community M6c, dominated by *Juncus effusus*. Those sub-communities are characterised by the dominant rush species growing over a carpet of bog-mosses, mainly *Sphagnum fallax*, with some *Sphagnum palustre*, and frequently *Polytrichum commune*. Associates include *Carex nigra*, *Carex echinata*, *Agrostis canina*, *Viola palustris* and *Rumex acetosa*.

### M10 *Carex dioica-Pinguicula vulgaris* mire

This community is characterised by a group of sedges that includes *Carex hostiana*, *Carex dioica*, *Carex panicea*, *Carex flacca* and *Carex viridula* ssp. *oedocarpa*, accompanied by *Pinguicula vulgaris*. There can be a few other vascular associates such as *Briza media*, *Linum catharticum*, *Erica tetralix* and *Drosera rotundifolia*. The ground is covered in a layer of calcicolous bryophytes, among them *Ctenidium molluscum*, *Campylium stellatum*, *Blindia acuta*, *Scorpidium scorpiodes* and *Drepanocladus* spp.

### M15 *Trichophorum cespitosum-Erica tetralix* wet heath

Mixtures of *Trichophorum germanicum*, *Erica tetralix*, *Calluna vulgaris* and *Molinia caerulea* define the typical sub-community, M15b. Associates include *Nathecium ossifragum*, *Potentilla erecta* and *Eriophorum angustifolium*. The grassy NVC M15d *Vaccinium myrtillus* sub-community is characterised by *Nardus stricta*, *Deschampsia flexuosa* and *Juncus squarrosus* along with *Vaccinium myrtillus*.

### M17 *Trichophorum germanicum-Eriophorum vaginatum* mire

NVC M17 mire is characterised by mixtures of *Eriophorum vaginatum*, *E. angustifolium*, *Trichophorum germanicum* and *Molinia caerulea* with patches of *Calluna vulgaris* and *Erica tetralix*. The bog-mosses are mainly *Sphagnum papillosum* and *Sphagnum capillifolium* with *Aulacomnium palustre* and some liverworts.

### M18 *Erica tetralix-Sphagnum papillosum* mire

Only small areas of mire are classified as NVC 18. They are similar to NVC 17, with an increased proportion of *Sphagnum* mosses, and, critically, the presence of *Sphagnum magellanicum*. These mires are very localised.

**M19 *Calluna vulgaris-Eriophorum vaginatum* mire**

*Calluna vulgaris* and *Eriophorum vaginatum* are predominant in this community that generally contains a lesser proportion of bog-mosses than either NVC M17 or NVC M18. Common vascular associates are *Vaccinium myrtillus*, *Eriophorum angustifolium* and *Empetrum nigrum*. On the highest ground there is often *Vaccinium vitis-idaea* and *Rubus chamaemorus*. Bog-mosses are typically represented by *Sphagnum capillifolium*, but wetter areas have *Sphagnum papillosum* and *Sphagnum fallax*. *Aulacomium palustre* can be also be present in wetter areas. Hypnoid mosses are frequent, including *Hypnum jutlandicum* and *Pleurozium schreberi*. Where bog-moss forms tight hummocks, there is often *Polytrichum strictum*.

**M20 *Eriophorum vaginatum* mire**

NVC M20 community is found on some of the high peaty ridges on the site - and often extends down shallow slopes – where grazing has been heavier. The chief characteristic of the vegetation is dominance by tussocky *Eriophorum vaginatum*. The community encompasses both Phase 1 categories of dry modified bog (E1.8) and wet modified bog, with *Molinia caerulea* playing an increased role in transitional communities (E1.7). The community is characterised by tussocky *Eriophorum vaginatum* domination, often with acid grassland elements and hypnoid mosses. Stands with the lowest diversity have been coded as M20a species-poor sub-community. Better quality examples have been coded as M20b *Calluna vulgaris-Cladonia* species sub-community. In the latter there is usually a small proportion of *Calluna vulgaris* and *Vaccinium myrtillus* can be well represented. Bog-mosses are usually limited to *Sphagnum capillifolium* and *S. fallax*. Hypnoid mosses, *Hypnum jutlandicum*, *Pleurozium schreberi* and *Hylocomium splendens* are usually more prominent in the *Eriophorum* tussocks.

**M23 *Juncus effusus/acuteiflorus-Galium palustre* rush-pasture**

This community is widely distributed throughout the site in ditches, along the margins of watercourses or in valley bottoms or on sloping ground within damp pastures. There are two sub-communities. The M23a sub-community is dominated by *Juncus acuteiflorus* and the M23b sub-community is dominated by *Juncus effusus*. The M23b sub-community dominated by *Juncus effusus* can be rather species-poor, grassy or weedy, with associates such as *Rumex acetosa*, *Cirsium palustre* and *Ranunculus repens*. The M23a *Juncus acuteiflorus* sub-community can be quite species-rich with associates such as *Filipendula ulmaria*, *Galium palustre*, *Lotus pedunculatus*, *Mentha aquatica*, *Succisa pratensis*, *Lychnis flos-cuculi*, *Cirsium palustre*, *Viola palustris*, *Ranunculus* spp. and *Rumex acetosa*. Common mosses are *Calliergonella cuspidata*, *Polytrichum commune* and *Pseudoscleropodium purum*. Many heavily drained stands contain acid grassland elements, giving a type of vegetation not yet included in the NVC, and are difficult to code at NVC level.

**M25 *Molinia caerulea-Potentilla erecta* mire**

NVC 25 community is dominated by *Molinia caerulea*, sometimes overwhelmingly so, and *Potentilla erecta* is present at usually low frequency. The community occurs frequently on sloping ground or extending from different mire types on blanket bog onto thinner peat. The M25a *Erica tetralix* sub-community, including elements from bog and heath such as *Erica tetralix* and *Calluna vulgaris*, is commonest. The grassier M25b sub-community is also quite common. That has acid grassland species such as *Nardus stricta*, *Anthoxanthum odoratum* and *Festuca ovina*. There are a few examples of the more herb-rich and marshier M25c sub-community with associates such as *Succisa pratensis*, *Angelica sylvestris* and *Mentha aquatica*. Frequent transitional forms have been mapped, between M25 and mires such as M20 or M15. There are also marshy or flushed communities that are intermediate between M25 and NVC M23, and also drier communities that are intermediates with various acid grassland communities (U4, U5 and U6 grasslands).

**M37 *Palustriella commutata-Festuca rubra* spring**

A few small mossy flushes add to the floristic diversity locally, referable to NVC M37 *Palustriella commutata-Festuca rubra* spring. They are indicated by target notes since they are too small to map. Bryophyte associates include *Philonotis fontana* etc. *Festuca rubra* and small sedges such as *Carex flacca*, *Carex panicea*, and *Carex viridula* are scattered sparsely through the mosses.

**H10 *Calluna vulgaris-Erica cinerea* heath**

Mixtures of *Calluna vulgaris* and *Erica cinerea* characterise NVC H10 heath, typically accompanied by *Galium saxatile*, *Potentilla erecta* and *Carex binervis*. Underneath the vascular plants is a bryophyte layer of *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Hypnum jutlandicum*.

**H12 *Calluna vulgaris-Vaccinium myrtillus* heath**

This community is very well represented across the open ground at the site. *Calluna vulgaris* is dominant in NVC H12, usually with subordinate *Vaccinium myrtillus* and hypnoid mosses (*Hypnum jutlandicum*, *Pleurozium schreberi*, *Hylocomium splendens* and *Rhytidiadelphus squarrosus*) with few other associates at any frequency. Transitions from heather-dominated NVC H12 to drier blanket bog (NVC M19) are common and are often obscure where a fairly uniform cover of shrubby heather forms a monotonous canopy.

**H18 *Vaccinium myrtillus-Deschampsia flexuosa* heath**

NVC H18 *Vaccinium-Deschampsia* heath occurs rarely in the site, in small patches at higher elevations. A few intermediate communities were mapped as intermediate between dry heath (dominated by *Vaccinium*) and acid grassland types such as in 'U5-H18'. NVC H18 is usually the result of heavy grazing of NVC H12 heath that has removed *Calluna vulgaris*.

**MG1 *Arrhenatherum elatius* grassland**

Coarse-leaved, bulky grasses such as *Dactylis glomerata*, *Holcus lanatus* and, usually most abundant, *Arrhenatherum elatius*, dominate NVC MG1. Umbellifers can be prominent, such as *Anthriscus sylvestris* and *Heracleum sphondylium*. Sprawling or climbing plants are common: *Rubus fruticosus*, *Galium aparine*, *Lathyrus pratensis* and *Vicia* spp. Other frequent associates are *Urtica dioica*, *Cirsium arvense*, *Centaurea nigra*, *Achillea millefolium*, *Plantago lanceolata* and *Rumex acetosa*.

**MG5 *Cynosurus cristatus-Centaurea nigra* grassland**

NVC MG5 is herb-rich grassland where the main grasses are fine-leaved species such as *Festuca rubra*, *Cynosurus cristatus*, *Agrostis capillaris* and *Anthoxanthum odoratum*. *Dactylis glomerata* and *Holcus lanatus* can be found but are not prominent in the vegetation. A large proportion of the community is made up by herbs such as *Centaurea nigra*, *Plantago lanceolata*, *Trifolium repens*, *T. pratense*, *Lotus corniculatus*, *Ranunculus* spp., *Prunella vulgaris* and *Rhinanthus minor*.

**MG6 *Lolium perenne-Cynosurus cristatus* grassland**

NVC MG6 grassland is a common community of improved pastures. The sward often has little variety. *Lolium perenne* is usually the most abundant grass and there can be much *Cynosurus cristatus* and *Festuca rubra*. *Holcus lanatus*, *Dactylis glomerata* and *Poa* spp can be frequent. Dicotyledonous associates are *Trifolium repens*, *Cerastium fontanum*, *Plantago lanceolata*, *Ranunculus acris*, *Achillea millefolium* and *Bellis perennis*.

**MG9 *Holcus lanatus-Deschampsia cespitosa* grassland**

The coarse-leaved grasses, *Deschampsia cespitosum*, *Holcus lanatus*, *Dactylis glomerata* and *Arrhenatherum elatius* make up the bulk of the vegetation of this community that usually occurs on permanently damp, poorly-drained or regularly inundated ground. *Deschampsia* and *Holcus* are usually the most abundant. The community is often rather



species-poor. A few sprawlers or tall dicotyledons are able to compete with the large *Deschampsia* tussocks, such as *Lathyrus pratensis*, *Angelica sylvestris* or *Rumex crispus*.

#### **MG10 *Holcus lanatus*-*Juncus effusus*-rush-pasture**

In this community *Juncus effusus* tussocks are scattered within a grassy matrix made up of *Holcus lanatus*, *Agrostis stolonifera*, *Poa trivialis*, *Ranunculus acris* and *Ranunculus repens*. NVC MG10 resembles a species-poor version NVC M23b sub-community, described above. The Typical sub-community, MG10a is grassier and weedier than NVC M23b, and tends to lack that community's common species, such as *Galium palustre* and *Ranunculus flammula*. The community is common in the western pastures belonging to Poldean Farm.

#### **U4 *Festuca ovina*-*Agrostis capillaris*-*Galium saxatile* grassland**

NVC U4 is a common community in acid grassland habitat where the underlying soils are less peaty and are more mineral-influenced. The defining characteristic is the presence of the named community grasses, *Festuca ovina* and *Agrostis capillaris*, as well as *Anthoxanthum odoratum* (NVC U4a). Other typical acid grassland species also occur, such as *Nardus stricta*, *Deschampsia flexuosa*, and *Luzula multiflora*. The most common herb associates are *Galium saxatile* and *Potentilla erecta*. *Rumex acetosa* and *Vaccinium myrtillus* can occur and can be frequent but not usually abundant. The most common moss species in general is *Rhytidiadelphus squarrosus* and there can be much *Pseudoscleropodium purum*. Other mosses such as *Pleurozium schreberi*, *Hylocomium splendens*, *R. loreus* and *Hypnum jutlandicum* are found more commonly in specific sub-communities. There are several examples of the *Holcus lanatus*-*Trifolium repens* sub-community U4b in areas where there has likely been some agricultural improvement.

#### **U5 *Nardus stricta*-*Galium saxatile* grassland**

A large proportion of the acid grassland is made up of this community, generally on steepening slopes, near burn sides, or free draining ridges but also on some of the higher ground and ridges where it is often associated with NVC U6 below. The defining characteristic is the dominance or abundance of the grass *Nardus stricta*. Typical associates are *Deschampsia flexuosa*, *Festuca ovina*, *Agrostis vinealis*, and *Anthoxanthum odoratum* and more local *Luzula multiflora*, *Carex binervis*, *C. pilulifera*, *C. panicea*, *Galium saxatile* and *Potentilla erecta*. *Vaccinium myrtillus* can be frequent but not usually abundant. Mosses include *Pleurozium schreberi*, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, *R. loreus* and *Hypnum jutlandicum*. NVC U5b sub-community is typical of the higher areas, where species such as *Deschampsia flexuosa*, *Carex nigra* and *Polytrichum commune* are well represented.

At higher altitudes, which often coincide with leveller ridges and plateaux, *Juncus squarrosus* can join the mix and low growing *Vaccinium myrtillus* can increase, sometimes joined by *V. vitis-idaea*. Mosses can include increased *R. loreus* and often *Racomitrium lanuginosum*.

#### **U6 *Juncus squarrosus*-*Festuca ovina* grassland**

U6 grassland is characterised by an abundance of the rush species *Juncus squarrosus*. Graminoid associates include a limited range of common grass species such as *Festuca ovina*, *Deschampsia flexuosa*, *Nardus stricta*, *Agrostis vinealis*, *Agrostis canina* and *Anthoxanthum odoratum* and the wood-rush *Luzula multiflora*. The common herbs *Galium saxatile* and *Potentilla erecta* are usually present and there can be frequent *Vaccinium myrtillus*. The most common communities on sloping areas or where the ground has been subject to draining and heavy grazing are NVC U6c and U6d.

Where the ground is more saturated, on flatter ground and on deep peat, the vegetation is represented by the NVC U6a sub-community, marked by *Eriophorum vaginatum* tussocks and the prominence of bog-mosses such as *Sphagnum capillifolium* and *S. fallax*.

Intergrading vegetation is found between NVC U6 and other grassland communities, as mentioned above. There are also intermediate stands of vegetation between NVC U6 and the various blanket bog and modified bog communities.

#### **U16 *Luzula sylvatica*-*Vaccinium myrtillus* tall herb community**

Several small stands of NVC U16 are scattered through the survey area. The vegetation corresponds to the species-poor NVC U16c sub-community where little else other than *Luzula sylvatica* is easily visible. The community is referred to by target notes since it is always too small to map.

#### **U19 *Oreopteris limbosperma*-*Blechnum spicant* community**

Scattered small patches of NVC U19 occur on various slopes but are too small to map and have only been noted in target notes. *Oreopteris limbosperma*, accompanied in places by *Blechnum spicant* and dryopterid ferns, typically forms a patchy canopy, growing over a bryophyte carpet of pleurocarpous mosses such as *Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus squarrosus*.

#### **U20 *Pteridium aquilinum*-*Galium saxatile* community**

NVC U20 is dominated by *Pteridium aquilinum*. The fern is accompanied by *Anthoxanthum odoratum*, *Festuca ovina*, *Holcus lanatus*, *Galium saxatile*, *Potentilla erecta* and *Rumex acetosa*. The mosses *Rhytidiadelphus squarrosus*, *Pseudoscleropodium purum* and *Hypnum jutlandicum* are common. This community is most frequent and extensive in the western part of the site, on the slopes above Glengap Burn and the Wamphray Water and on the western slopes of Gallatae.

#### **U21 *Cryptogramma crispa*-*Deschampsia flexuosa* community**

*Cryptogramma crispa* is the most abundant plant in NVC U21. There can be some *Deschampsia flexuosa*, *Festuca ovina*, *F. vivipara*, *Nardus stricta*, *Agrostis capillaris* and *Anthoxanthum odoratum*. *Galium saxatile* and various bryophytes (*Andraea rupestris*, *Racomitrium* spp) and lichens can form sheets over the stones. Scree habitat within the site is confined to a very few areas and at one of these locations *Cryptogramma* is present, giving vegetation that is roughly approximate to NVC U21.

#### **S9 *Carex rostrata* swamp**

One small area of this community is found at Combe Rig beside Cogie at the proposed western entrance to the site. It is referable to the S9a sub-community, being dominated by *Carex rostrata*. The community grades into NVC M23 mire at the drier margins.

#### ***Juncus effusus* acid grassland community**

On the north east slopes of Corse Law there is vegetation with tussocks of *Juncus effusus* amongst acid grassland typical of U4/U5 grassland. This is similar to that described by Averis et al in 'An Illustrated Guide to British Upland Vegetation' as a form of species-poor vegetation consisting of large tussocks of *Juncus effusus* beneath which there is a sward of typical acid grassland species including *Agrostis capillaris*, *Festuca ovina*, *Anthoxanthum odoratum*, *Nardus stricta*, *Galium saxatile*, *Potentilla erecta* and the moss *Rhytidiadelphus squarrosus*.

Similar vegetation is found with *Juncus acutiflorus* replacing *Juncus effusus* in the same area.

**Appendix 8.9 – Phase 1 Target Notes Description****Habitats of significance highlighted in green****Target notes for south-eastern forest area including Silton Forest**

1	317748	594479	Extensive formerly improved grassland below track with much <i>Urtica dioica</i> .
2	317921	594573	Below track narrow valley with ash and hazel woodland; upstream with complex (hard to map) open mosaic of blocks of new plantation (broad-leaved), acid grassland, bracken, flushes and some stands of nettle.
3	318055	594999	Valley mosaics of acid or wet grassland and bracken mosaic, with local new plantation blocks (over <i>Ranunculus repens</i> and <i>Urtica dioica</i> ).
4	317318	594993	Steep east side valley side with bracken and heath; downstream dense scrub dominates (hawthorn with hazel) – hard to access. West bank with more open pine plantation (much fern).
5	317362	595224	Level grassy area by burn with frequent bracken and <i>Luzula sylvatica</i> , local diverse; herbs include <i>Pimpinella saxifraga</i> and <i>Cirsium helenoides</i> , and to burn edge some <i>Cochlearia</i> sp. Bracken and dry heath on steep east bank slope.
6	317320	595602	Several steep sided valleys meet, with heather or <i>Luzula sylvatica</i> on steeper part, otherwise bracken and acid grassland, and some flushes ( <i>Molinia</i> or <i>Juncus</i> ); also, some patchy scrub.
7	317291	595671	Small feeder valley with central <i>Juncus acutiflorus</i> flush (Some <i>Chrysosplenium oppositifolium</i> , <i>Stellaria alsine</i> ), and to sides brackens or wet grassland.
8	316990	595508	East bank with heath above but below some marshy grassland with some <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> stands, and quite diverse with <i>Carex flacca</i> , <i>Ajuga reptans</i> , <i>Angelica sylvestris</i> , <i>Succisa pratensis</i> , <i>Centaurea nigra</i> and <i>Cirsium helenoides</i> ; <i>Luzula sylvatica</i> and ferns to narrow west bank below larch plantation.
9	316911	595714	Steep embankment with heather and blaeberry (occasional <i>Luzula sylvatica</i> ); ferns and heather to the short west bank above water.
10	316904	595820	Dry heath across steep embankment; here local stand of hawthorn scrub (some <i>Primula vulgaris</i> , <i>Oxalis acetosella</i> , <i>Viola riviniana</i> and ferns include <i>Oreopteris limbosperma</i> ).
11	316915	595805	Small valley with dense stand of <i>Luzula sylvatica</i> , plus patches of <i>Cirsium helenoides</i> .
12	316825	595903	Steep bank down to burn with acid grassland locally much bracken (on slope and leveller areas by burn); west bank with short embankment with heather and ferns.
13	316826	595944	Steep crescent bank clothed with heather and blaeberry plus ferns; bracken becomes dense upstream; steep west bank (below conifers) with dense willow scrub plus ferns and stands of bracken (mostly above).
14	317057	596400	West bank with short slope supporting bracken or locally heather; east bank with much <i>Filipendula ulmaria</i> with some wet grassland ( <i>Deschampsia cespitosa</i> ).
15	317186	596643	Large <i>Filipendula</i> dominated marsh with <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Chrysosplenium oppositifolium</i> , <i>Juncus acutiflorus</i> , <i>Stellaria alsine</i> plus <i>Cochlearia officinalis</i> , <i>Cirsium helenoides</i> and <i>Carex lasiocarpa</i> .
16	317210	596701	North of bridge broad valley with large stand of <i>Filipendula ulmaria</i> marsh ( <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Juncus acutiflorus</i> ) with further north areas of wet grassland; steeper west bank with acid grass and large patch of willow scrub (steep, flushed).

17	317038	596718	Valley recently felled, with steep southern bank with stands of heather and <i>Luzula sylvatica</i> (locally with <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> above, linked to relic or recovering bog fringe) – some broad-leaved planting; north bank with acid grass, but local bracken patches (and some rosebay willowherb).
18	316728	596767	Southern edge with relic bog with <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , and rare <i>Vaccinium vitis-idaea</i> ; below mosaic of heath, bracken and <i>Filipendula</i> marsh – recently felled here.
19	316409	596852	Wet <i>Juncus</i> or <i>Molinia</i> mires to burn sides or side flushes; some steeper banks with patches of heather.
20	316357	596815	Ride with relic bog vegetation between felled plantations; heather with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> and pleurocarp mosses.
21	316264	596737	Very tussocky bog in previously felled area but replanted with broad-leaves and some sitka spruce regeneration.
22	317956	596810	Broad ride glade, <i>Molinia</i> dominated but here frequent <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> .
23	317840	596496	Deep new drain (fed by older ones) with increasing <i>Molinia</i> and some <i>Juncus effusus</i> (drains and flushes) local <i>Eriophorum vaginatum</i> relics.
24	317846	596427	Broad strip of disturbed bog with deep drains (some recently cleared) and old <i>Calluna</i> dominated ridges to outer edges; recovering bog vegetation with <i>Eriophorum</i> and <i>Calluna</i> plus mosses, <i>Juncus effusus</i> and <i>Agrostis canina</i> and occasional willow colonist. <i>Molinia</i> increases to the east.
25	317928	596437	<i>Molinia</i> increases further east, but still much <i>Eriophorum vaginatum</i> but less ericoids and bog elements (mostly pleurocarp mosses).
26	317947	596394	Lower lying graminoid bog vegetation with both <i>Eriophorum</i> and <i>Molinia</i> .
27	317991	596368	Bog elements extend east with some <i>Trichophorum</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccus</i> and <i>Sphagnum</i> .
28	317985	596283	Diverse bog with much <i>Calluna vulgaris</i> with <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium oxycoccus</i> , with <i>Sphagnum rubellum/capillifolium</i> and some <i>S. papillosum</i> .
29	318070	596076	Central valley with <i>Juncus effusus</i> plus <i>Ranunculus repens</i> , <i>Cirsium palustre</i> , <i>Stellaria alsine</i> and <i>Viola palustris</i> ; <i>Molinia</i> dominated mire to both sides.
30	318080	595970	Uneven, sloping bog margin with tussocky <i>Molinia</i> domination; occasional bog element ( <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> ) with <i>Vaccinium myrtillus</i> and <i>Galium saxatile</i> ; moss frequent with occasional <i>Sphagnum rubellum</i> , <i>S. palustre</i> and <i>Rhytidiadelphus loreus</i> .
31	318124	595894	Local <i>Juncus effusus</i> flushes (with <i>Rumex acetosa</i> , <i>Angelica sylvestris</i> , <i>Cardamine pratensis</i> and <i>Cirsium palustre</i> ), through <i>Molinia</i> mire margin and local bracken stands on steeper banks.
32	318256	595675	Mosaic of acid grass with bracken and some <i>Luzula sylvatica</i> ; wetter below with <i>Juncus</i> marsh (and <i>Molinia</i> above); patchy scrub with eared willow.
33	318393	595565	Scrubby valley, difficult to map or code: steep sides with acid grass (some wet and flushed) with scrub and new planting; below wet grassland ( <i>Holcus</i> – <i>Deschampsia</i> ) with <i>Juncus</i> and <i>Filipendula</i> ; above, the forest edge with tussocky <i>Molinia</i> .
34	318411	595490	Drain with some <i>Eleocharis palustris</i> and <i>Typha latifolia</i> .
35	318477	595548	Both sides of the old track with marshy grassland (mosaics or intermediate <i>Juncus effusus</i> , <i>Deschampsia cespitosa</i> and <i>Molinia caerulea</i> ).
36	318574	595502	Low hill to the south of the track with much <i>Juncus effusus</i> but also spaced young trees; below to the burn marshy grassland with <i>Filipendula ulmaria</i> and <i>Deschampsia cespitosa</i> , with occasional bracken (scattered or dense).

37	318556	595335	Upper valley with stands of bracken and marshy Filipendula ulmaria (and coarse grassland), with below increasing scrub woodland (ash, hazel, willow, hawthorn and blackthorn) – some above presumably planted.	55	320445	594574	Old ride with gravelly track bed covered by moss (some lichens), herbs and sitka seedlings plus wet grassland and rushes; herbs include Trifolium spp., Prunella vulgaris and some Linum catharticum.
38	318790	595540	Large hollow (below track embankment with Filipendula ulmaria extending down to the burn, but above is a patch of Carex acutiformis).	56	320190	595794	Wedge shaped area of former (possibly open) plantation (some brash and logs) with tussocky relic (or recovering) bog; Molinia and Eriophorum vaginatum common with Calluna vulgaris, Erica tetralix, Vaccinium myrtillus, Deschampsia flexuosa, Galium saxatile plus Pleurozium schreberi, Sphagnum capillifolium and Polytrichum strictum; Eriophorum vaginatum commoner to wetter centre.
39	318888	595429	Upper valley with complex mosaic of vegetation difficult to map accurately; steeper slopes with acid grassland plus some bracken or flushed (Juncus or Filipendula); burn sides with stands of Filipendula ulmaria, local bracken and wet grassland (Deschampsia cespitosa and Holcus); also, local scrub with some plantation blocks.	57	319945	595883	Very small pool to track edge (some Callitriche stagnalis) with boggy relic to plantation edge; track itself gravelly with moss and sitka seedlings (and wet grass, Deschampsia cespitosa etc).
40	319133	595195	Track sides with stands of rosebay willowherb or Juncus acutiflorus, or wet acid grassland; plus, blocks of planted trees.	58	319901	595926	Wetter hollow with some open water and floating mats of Sphagnum with Eriophorum vaginatum and Carex rostrata (NVC M2b-M4).
41	319809	594257	Local ridge of bracken but otherwise past enriched but ungrazed grassland (much Holcus with Ranunculus repens plus local Cirsium arvense, Urtica dioica and Juncus effusus).	59	319883	595947	Felled area with recovering bog; much Eriophorum vaginatum and Calluna vulgaris with some Erica tetralix and Vaccinium myrtillus, and mosses such as Sphagnum rubellum, S. fallax, Polytrichum commune, Pleurozium schreberi, Polytrichum strictum, Rhytidiadelphus loreus and occasional Cladonia.
42	319768	594362	Small valley with Molinia dominated mire: to west side more Juncus effusus, but to the east boggy relics with Eriophorum vaginatum, Polytrichum commune, Erica tetralix, Calluna vulgaris, Dryopteris carthusiana, Vaccinium oxycoccos and Sphagnum rubellum and S. fallax.	60	319800	595894	Broad level area of disturbed bog, very tussocky, with cover of Calluna vulgaris and Eriophorum vaginatum; margins with felled trees and much young growth (regeneration or planted); associates include Vaccinium myrtillus, Deschampsia flexuosa, Erica tetralix and rare Molinia, Trichophorum, Eriophorum angustifolium and Empetrum nigrum; mosses include Hypnum jutlandicum, Polytrichum commune, Sphagnum capillifolium, Pleurozium schreberi and local Cladonia (C. impexa, C. arbuscula).
42	319726	594363	North side of small valley with local rock outcrop supporting Teucrium, Vaccinium myrtillus, Polypodium vulgare, Erica cinerea, Hieracium sp, and occasional Thymus; marsh strip below with Juncus acutiflorus (then Molinia).	61	319708	595806	Old wall, lichen encrusted, topped with Cladonia lichens, moss and heather.
44	319708	594374	Parallel small valley with similar Molinia plus occasional Eriophorum vaginatum; some Sphagnum capillifolium and Polytrichum strictum hummocks, one with Vaccinium oxycoccos.	62	319665	595732	Wetter bog to the north of the wall but also much sitka spruce regeneration (possibly planting), and appearing wet heath-like: Trichophorum germanicum common with Narthecium ossifragum, Erica tetralix, both Calluna vulgaris and Eriophorum vaginatum locally scarce, and some Vaccinium oxycoccos, Empetrum nigrum; bryophytes include Sphagnum tenellum, local S. papillosum and S. cuspidatum, S. rubellum, Hypnum jutlandicum and often frequent Cladonia spp.
45	319935	594459	Burn sides with marshy grassland to flushed or wetter sides, but some acid grass where steeper; Molinia occurring above to plantation edges. Several blocks of planted, or regenerating, stunted trees (ash frequent).	63	319677	595672	Strip of Molinia dominated vegetation separating further block of similar Trichophorum dominated bog (wet heath).
46	319935	594481	Filipendula ulmaria dominates with Angelica, Geum rivale and some Juncus acutiflorus.	64	319592	595639	Steep sloping rand (Molinia dominated) to the marshy low-lying area by the burn, where stands of Juncus acutiflorus (locally with Sphagnum closer to the Molinia/peat edge); associates nearer burn include Filipendula ulmaria, Deschampsia cespitosa, Ranunculus repens, Galium palustre, Stellaria alsine, Cirsium palustre and Valeriana dioica.
47	319959	594558	Steepening bog margin (down to edge above burn), dominated by Molinia with few ericoids but more Hylocomium splendens, Pleurozium schreberi and Galium saxatile (old drain).	65	319515	595803	Broad Molinia rand (c. 3m drop down to burn) with some ericoids; western side with wet Deschampsia–Holcus grassland plus Juncus acutiflorus.
48	320012	594612	Extensive tussocky bog on gentle slope, occasional to frequent spruce colonists; Molinia is abundant but locally much Eriophorum vaginatum and Calluna vulgaris, plus Vaccinium myrtillus, Erica tetralix, rare No, Empetrum nigrum, with Polytrichum commune, Pleurozium schreberi, Aulacomnium palustre, Sphagnum palustre, S. capillifolium, and occasional hummocks with Polytrichum strictum and Cladonia spp.	66	319536	595941	Level area of tussocky Molinia dominated modified bog, with abundant sitka regeneration (1 to 3m tall); locally quite diverse with Erica tetralix, Eriophorum vaginatum, Calluna vulgaris plus Trichophorum germanicum, Narthecium ossifragum, Empetrum nigrum and Vaccinium oxycoccos, Sphagnum mostly S. capillifolium (or rubellum) with rare S. cuspidatum and S. papillosum, plus Hypnum jutlandicum and Pleurozium schreberi.
49	320050	594677	Wetter bog here (little Molinia) with Eriophorum vaginatum and large hummocks, and some Vaccinium oxycoccos.	67	319538	595987	Slope with increased dominance of Molinia caerulea.
50	320030	594698	Molinia dominates central strip and all the way up gentle slope to the wall.	68	319422	596060	Marshy area about burn, locally diverse, with Filipendula ulmaria, Geum rivale, Ajuga reptans, Succisa pratensis, Valeriana dioica, Juncus acutiflorus and Carex spp. (C. echinata, C. hostiana, and possibly C. lasiocarpa).
51	320079	594771	Molinia dominated with some old peat edges and occasional drain or lower-lying flush (occasional Eriophorum vaginatum).				
52	319945	594739	Very wet mire area (fed by drains from plantation spur) with much Sphagnum plus Eriophorum vaginatum and Molinia caerulea.				
53	319897	594774	Long triangular spur between plantations on gentle slope with modified bog; dominated by Molinia but locally prominent Calluna and other bog relics.				
54	319728	594871	Level ground to broad burn channel between conifers; east side with much Molinia (old bog edges) but to the west a mosaic of Juncus acutiflorus marsh with some wet acid grass (local Molinia patches); some scrubby trees – ash, hazel, hawthorn (probably planted).				



69	319386	596047	Burn sides with abundant wet marsh (much <i>Filipendula ulmaria</i> and <i>Juncus acutiflorus</i> – rare <i>Carex rostrata</i> ); above to the plantation edges are narrow to broad strips of <i>Molinia</i> (degraded bog).
70	319129	595984	Plantation ride with wet grassland: much <i>Holcus lanatus</i> , <i>Deschampsia cespitosa</i> and <i>Juncus effusus</i> , with occasional <i>Molinia</i> relic.
71	319129	596015	Broad ride with here much <i>Molinia</i> with some <i>Eriophorum vaginatum</i> ; further north wet grassland predominates with frequent <i>Juncus effusus</i> .
72	318930	595851	Small stand of <i>Carex rostrata</i> in wetter hollow (some <i>Galium uliginosum</i> ).
73	318921	595915	Shallow burn valley with above, to the plantation edges, stands of <i>Molinia</i> ; nearer the burn low-lying areas with mosaic of marsh ( <i>Juncus acutiflorus</i> or <i>Filipendula ulmaria</i> ) with local areas of wet grassland ( <i>Deschampsia cespitosa</i> , <i>Holcus lanatus</i> ). Local patches of ash (planted).
74	318830	596066	Confluence of various small valleys and rides (drains) with mostly <i>Juncus acutiflorus</i> dominated marsh with wet grassland and several blocks of new broad-leaves (most stunted and in poor condition). Feeders upstream with similar marshy conditions with <i>Juncus</i> but also more <i>Molinia</i> mire (not visited far upstream).
75	318869	596191	Open valley with level marshy vegetation: much <i>Juncus acutiflorus</i> with local <i>Molinia caerulea</i> and <i>Deschampsia cespitosa</i> , plus <i>Rumex acetosa</i> , <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> , <i>Viola palustris</i> and mosses.
76	319355	596569	Broad valley with diverse marshy vegetation, locally diverse herbs, and some <i>Sphagnum</i> zones (M6d).
77	319358	596617	Small patch (sparse and stunted) of <i>Phragmites</i> .
78	319297	596670	Broad marshy channel with a fen type vegetation (lagg) with <i>Juncus acutiflorus</i> plus local <i>Filipendula ulmaria</i> (west side – and outflow drain), <i>Molinia caerulea</i> (bog side), <i>Carex rostrata</i> , <i>C. lasiocarpa</i> , <i>Caltha palustris</i> , <i>Comarum palustre</i> , <i>Ajuga reptans</i> , <i>Succisa pratensis</i> , <i>Valeriana dioica</i> and mosses include some <i>Sphagnum teres</i> .
79	319322	596696	Local area with increased <i>Trichophorum germanicum</i> and <i>Erica tetralix</i> , <i>Calluna vulgaris</i> and some <i>Sphagnum tenellum</i> (wet heath affinities).
80	319378	596680	Bog on gentle slope with much <i>Trichophorum germanicum</i> and <i>Erica tetralix</i> (plus <i>Calluna</i> , <i>Eriophorum</i> , <i>Empetrum</i> , <i>Molinia</i> ) but limited <i>Sphagnum</i> – affinities to wet heath (M15).
81	319417	596683	Leveller bog near to wall (some sitka) with <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> , plus much <i>Sphagnum</i> and <i>Vaccinium oxycoccos</i> .
82	319388	596746	Bog with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Calluna vulgaris</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum capillifolium</i> , <i>S. palustre</i> , <i>S. papillosum</i> and <i>Polytrichum strictum</i> .
83	319358	596798	<i>Molinia</i> dominates but initially with wet mire associates (not bog).
84	319394	596975	<i>Filipendula</i> dominated fen with <i>Ajuga reptans</i> , <i>Juncus acutiflorus</i> , <i>Angelica sylvestris</i> and <i>Valeriana dioica</i> ; <i>Filipendula</i> extends down drain line.
85	319207	597273	Very tussocky and uneven wedge of <i>Eriophorum vaginatum</i> bog with <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> .
86	319103	597328	Wet tussocky <i>Eriophorum vaginatum</i> to margin with much moss ( <i>Pleurozium schreberi</i> , <i>Sphagnum palustre</i> , <i>S. fallax</i> ), <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> and <i>Carex nigra</i> .
87	319123	597351	Ridge near wall with acid grassland (much <i>Holcus</i> ) with <i>Juncus effusus</i> flushes below (feeding bog).
88	318986	597270	Central flush of wet <i>Eriophorum vaginatum</i> with <i>Erica tetralix</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.

89	318965	597240	Level area of tussocky bog with abundant <i>Calluna vulgaris</i> plus <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , rare <i>S. papillosum</i> and <i>Aulacomnium palustre</i> . Several sitka colonists.
90	318958	597221	Flush of wet <i>Eriophorum vaginatum</i> (little <i>Calluna</i> ) with <i>Sphagnum fallax</i> .
91	318935	597095	Relic bog spilling down from bog above with <i>Eriophorum vaginatum</i> but also <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum palustre</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
92	318890	597148	Bog strip between ridge with abundant <i>Calluna vulgaris</i> plus <i>Eriophorum vaginatum</i> , with <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> , <i>Sphagnum capillifolium</i> , <i>S. palustre</i> plus some <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Vaccinium oxycoccos</i> .
93	318881	597120	Bog strip becoming graminoid with very tussocky <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> and between local <i>Sphagnum palustre</i> .
94	318878	597099	Peat edges with some <i>Eriophorum vaginatum</i> below extending down towards plantation.
95	318814	597148	Ridge of acid grassland with wet <i>Holcus</i> grassland and <i>Juncus effusus</i> on slopes; <i>Molinia</i> below and then grades to <i>Eriophorum vaginatum</i> bog edges.
96	318721	597161	Disturbed rectangular hollow with acid grass.
97	318641	597160	<i>Juncus effusus</i> patch with <i>Rumex acetosa</i> , <i>Cardamine pratensis</i> , <i>Cirsium palustre</i> , <i>Galium saxatile</i> and <i>Rhytidiadelphus squarrosus</i> .
98	318629	597181	<i>Molinia</i> and <i>Eriophorum vaginatum</i> modified bog with <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Rumex acetosa</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
99	318513	597124	Narrowing bog margin with <i>Molinia</i> and <i>Eriophorum vaginatum</i> plus <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Agrostis vinealis</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
100	318948	597419	Small ridge with acid grassland (some <i>Carex binervis</i> ) with local <i>Vaccinium myrtillus</i> heath; <i>Luzula sylvatica</i> stand near wall below.
101	318757	597459	<i>Calluna</i> dominates up the slope with much <i>Sphagnum capillifolium</i> plus <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> and much <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> and <i>Hypnum jutlandicum</i> .
102	318830	597591	<i>Juncus effusus</i> mire, with much <i>Sphagnum</i> about drains and flushes to both burn sides, and down burn valley but here more mineral-enriched.
103	318839	597619	Tussocky drained bog on sloping but uneven ground; locally with much <i>Calluna vulgaris</i> , plus <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , with large moss hummocks containing <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>R. squarrosus</i> , <i>Sphagnum capillifolium</i> .
104	318419	597971	Leveller ground with increased <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; rises beyond with <i>Molinia caerulea</i> abundant.
105	318298	598266	Small patch of <i>Luzula sylvatica</i> by fence, but otherwise bog extensive but with some local patches of wet <i>Molinia caerulea</i> .
106	318192	598445	Broad peaty ride to both sides of fence between conifer block (northern side over relic bog); <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Vaccinium myrtillus</i> , rare <i>V. oxycoccos</i> , <i>Empetrum nigrum</i> , <i>Erica tetralix</i> , local <i>Molinia caerulea</i> (some patches), <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
107	318020	598827	Narrow valley with some <i>Molinia</i> immediately below, but then flushed acid grassland with <i>Juncus effusus</i> ; further below more acid grassland and bracken

			patches.
108	318091	597692	Shallow burn crosses track between young plantations; marshy above ( <i>Juncus effusus</i> but some <i>Molinia</i> zones) but below much bracken and flushed grassland.
109	317301	597389	Steep bank with some patches of heath (mainly blaeberry); burn sides below with various herbs and acid to neutral grassland, and central flushes with much <i>Filipendula</i> marsh but most recently planted with broad-leaves.
110	317276	597530	Steep western bank with patches of heather ( <i>Molinia</i> above – but also new planting); below new planting in <i>Filipendula</i> marsh and increasing scrub (some purple osier); locally diverse grass with <i>Luzula sylvatica</i> , <i>Centaurea nigra</i> , <i>Geum rivale</i> , <i>Filipendula ulmaria</i> and ferns.
111	316400	597070	Western bank with steep bracken zones but much with new broad-leaved planting; latter spreads up hillside over recovering bog vegetation (all way to track?). Easter side with patches of acid grassland, bracken, heath or <i>Molinia</i> .
112	316428	597289	Valley floor with large <i>Filipendula</i> stand plus <i>Juncus acutiflorus</i> flushes; <i>Molinia</i> frequent up the eastern side (some heather), west with narrow acid grass but above new broad-leaved plantation over bog (but recently felled conifers).
113	316513	598057	Large marshy vegetation by the burn with <i>Juncus acutiflorus</i> plus <i>Angelica sylvestris</i> , <i>Ranunculus repens</i> , <i>Cardamine pratensis</i> , <i>Ajuga reptans</i> , <i>Stellaria alsine</i> and <i>Cochlearia officinalis</i> ; marshy vegetation extends down valley but with <i>Molinia</i> on slopes above.
114	316221	598182	Wet acid grassland by open burn sides with patches of <i>Juncus</i> or <i>Filipendula</i> marsh along leveller sides.
115	316111	598171	Small valley with large flushes of <i>Filipendula ulmaria</i> and acid grassland; south side with much heather on slope but <i>Molinia</i> above
116	315725	598530	Valley with steep sides, north side with much heather and some large erosion slips – and further down bracken, otherwise acid grassland; above to south side strip of tussocky bog vegetation.
117	315870	598626	Small pool with <i>Potamogeton natans</i> and <i>P. berchtoldii</i> .
118	316691	599006	Valley below (not visited) with mosaic of acid grassland and large bracken zones plus scattered scrub.
119	316623	599190	Narrow bank of <i>Molinia</i> (with local heath stands) by small burn; above (over track) dense stand of willow scrub.
120	317097	599095	Bank above track (not planted) with relic heath plus occasional <i>Molinia caerulea</i> and <i>Luzula sylvatica</i> , plus bracken stands.
121	317319	599309	Broad valley with frequent new planting in mosaic with marshy patches ( <i>Filipendula</i> ), wet grassland ( <i>Deschampsia cespitosa</i> ) and rosebay willowherb, plus local willow scrub and steeper banks with more acidic grassland.
122	317124	599466	Small feeder with new planting but some areas of bracken and acid grassland, plus local <i>Molinia</i> above.
123	316858	599939	South bank of burn with steep sides supporting bracken here, but upstream heather dominates; burn sides with wet grassland and marsh.
124	317243	599512	Large stands of wet <i>Filipendula ulmaria</i> marsh (with <i>Geum rivale</i> , <i>Chrysosplenium oppositifolium</i> ) and wet grassland ( <i>Deschampsia cespitosa</i> with spreading raspberry).
125	317096	599736	Broad levellish valley (some old walls), poorly draining with extensive new broad-leaved planting (some conifer blocks to west side); east side with some steeper banks with heather and bracken stands.
126	317036	599972	Bothy area with amenity grass plus stands of <i>Urtica dioica</i> , <i>Chamerion angustifolium</i> and <i>Spiraea</i> sp.

127	317050	600051	Burnside acid to neutral grassland but locally herb rich and variable (some <i>Deschampsia cespitosa</i> and local <i>Calluna vulgaris</i> ); associates include <i>Carex flacca</i> , <i>Succisa pratensis</i> , <i>Potentilla erecta</i> , <i>Centaurea nigra</i> , <i>Galium verum</i> , <i>Achillea millefolium</i> and <i>Dactylorhiza</i> sp. East bank with conifers and scrub.
128	317421	600981	Ride down steep slope with flushed grassland and above <i>Luzula sylvatica</i> and <i>Chamerion angustifolium</i> .
129	317440	600979	Broad marshy area below old dyke, with much <i>Filipendula ulmaria</i> plus <i>Ranunculus repens</i> , <i>Cirsium palustre</i> , <i>Angelica sylvestris</i> , <i>Viola palustris</i> , <i>Valeriana dioica</i> and <i>Ajuga reptans</i> .
130	317518	601025	Broad valley with stands of <i>Juncus</i> or <i>Filipendula</i> to burn and feeder flushes (rare <i>Luzula sylvatica</i> ), with much new broad-leaved planting to east bank, and less so to east.
131	317535	600935	Broad valley with mosaic of wet acid grassland plus <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> to burn and some larger flushed zones; much new broad-leaves planting to east bank.
132	315959	600097	Broad slope between plantations with a wet heath cover (more <i>Molinia</i> below, but drier above); occasional <i>Juncus</i> or <i>Deschampsia cespitosa</i> flushes.

#### Target notes for north western area including Dundoran Plantation, Broadfield Height and Craig Fell

1	313057	598436	Strip of wet heath and mire above burn ( <i>Sphagnum denticulatum</i> , <i>Carex echinata</i> , <i>Molinia caerulea</i> and some ericoids).
2	313053	598460	Heavily drained mire ( <i>Juncus acutiflorus</i> with some <i>Molinia</i> to centre)
3	313031	598490	Drained mire with some wet heath elements ( <i>Calluna</i> , <i>Molinia</i> , <i>Juncus squarrosus</i> , <i>Carex</i> spp., and some <i>Sphagnum</i> ).
4	313010	598521	Relic areas of acid grass with wet heath (short grazed <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> and some <i>Sphagnum capillifolium</i> ).
5	313023	598582	Large stony erosion spill below small valley, meets drained mire.
6	312935	598691	Locally increased <i>Molinia caerulea</i> , and some <i>Juncus squarrosus</i> , but still much <i>Juncus acutiflorus</i> with other wet acid grass former bog relics (frequent moss).
7	312901	598753	Intermediate wet acid grassland with <i>Juncus acutiflorus</i> zones in heavily (recently) drained mire; some <i>Sphagnum</i> and <i>Carex echinata</i> but not appearing peaty (drain exposure mineral).
8	313084	598844	Peaty wet acid grassland extends down slope with <i>Juncus squarrosus</i> , <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Calluna vulgaris</i> (short), <i>Polytrichum commune</i> and pleurocarp mosses.
9	313381	598694	<i>Juncus squarrosus</i> locally dominant to summit acid grassland with <i>Nardus stricta</i> , <i>Anthoxanthum odoratum</i> , <i>Carex nigra</i> , short <i>Vaccinium myrtillus</i> , <i>Potentilla erecta</i> , <i>Pleurozium schreberi</i> and <i>Rhytidadelphus squarrosus</i> .
10	313327	598874	Strip of <i>Juncus squarrosus</i> dominated acid grassland but here with some <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> (peat c. 25cm) plus short <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Carex nigra</i> .
11	313280	598923	Wet depression with heavily drained bog relic: much <i>Sphagnum fallax</i> plus <i>S. papillosum</i> and <i>S. rubellum</i> , plus <i>Aulacomnium palustre</i> , <i>Eriophorum vaginatum</i> e. <i>angustifolium</i> , <i>Trichophorum germanicum</i> and <i>Carex nigra</i> .
12	313087	598964	Slope with more distinctly (than area to south) boggy relics with common <i>Eriophorum vaginatum</i> tussocks plus some short <i>Vaccinium myrtillus</i> and <i>Calluna vulgaris</i> , with frequent <i>Sphagnum</i> (locally much) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> and <i>Pleurozium schreberi</i> .
13	313054	599054	Short pasture (and bracken) extends up steep burn sides; occasional fern, foxglove,



			<i>Viola riviniana</i> , <i>Oxalis acetosella</i> and some heather to rock face.
14	312928	599066	Erosion gully and block of <i>Juncus effusus</i> .
15	312615	598993	Ride through forest dominated by <i>Vaccinium myrtillus</i> (aerial photos indicate normally more heather).
16	312661	599034	Level summit area with some relic bog vegetation, including much <i>Sphagnum</i> : <i>Eriophorum vaginatum</i> with <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and some <i>Vaccinium vitis-idaea</i> .
17	312706	599115	Flushed slope with some flushed <i>Nardus</i> grassland, with diverse low-growing species: <i>Carex panicea</i> , <i>Succisa pratensis</i> , <i>Carex hostiana</i> , <i>Pedicularis sylvatica</i> and some <i>Anemone nemorosa</i> .
18	312701	599169	Acid grassland above but with much <i>Trichophorum germanicum</i> plus some short <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> (wet heath affinities); bryophytes include rare <i>Leucobryum glaucum</i> .
19	312684	599196	Increased, but short grazed, wet heath elements on slope above flushes (frequent <i>Trichophorum germanicum</i> and short <i>Calluna vulgaris</i> ).
20	312699	599230	Flushed hill slope locally very herb rich with <i>Carex</i> spp. <i>Succisa pratensis</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> and bryophytes include <i>Climacium dendroides</i> and <i>Rhytidiadelphus triquetrus</i> .
21	312664	599206	Slope with increased wet heath or bog relics with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> and <i>Sphagnum</i> (but peat shallow); grass dominated surrounding area about with often much <i>Trichophorum</i> .
22	312614	599182	Small patch of relic bog (dry) with <i>Eriophorum vaginatum</i> but some <i>Sphagnum</i> .
23	312604	599227	Small depression with heavily drained wet bog; much <i>Sphagnum papillosum</i> plus <i>Eriophorum vaginatum</i> and some <i>Vaccinium oxycoccos</i> ; peat c. 50cm deep.
24	312536	599144	Extensive upper slope of field supporting bent-fescue pasture (not as appearing on recent aerial images), locally with scattered, but increasing bracken; species limited but some <i>Poa humilis</i> , <i>Potentilla erecta</i> , <i>Conopodium majus</i> and <i>Veronica chamaedrys</i> . More diversity in wet flushes below
25	312505	599443	Herb rich flushes with <i>Ajuga reptans</i> , <i>Cardamine pratensis</i> , <i>Filipendula ulmaria</i> , <i>Lysimachia nemorum</i> , <i>Geum rivale</i> , <i>Ficaria verna</i> , <i>Galium palustre</i> and rare sedge <i>Carex laevigata</i> (some <i>Potentilla sterilis</i> , <i>Viola riviniana</i> and <i>Primula vulgaris</i> ).
26	312700	599411	Further up valley mire is very intermediate transition state from bog above to more distinctly <i>Juncus</i> dominated mire below; <i>Juncus squarrosus</i> and <i>Eriophorum vaginatum</i> both scarce as is <i>Sphagnum</i> .
27	312742	599349	Broad valley mire but very heavily drained with few bog elements surviving (some cells of <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> , <i>Juncus squarrosus</i> and <i>Molinia caerulea</i> ) though with much wet acid grassland as well dense to invasive <i>Juncus acutiflorus</i> ; locally diverse herbs in mineral flushes with <i>Succisa pratensis</i> , <i>Ajuga reptans</i> , <i>Lysimachia nemorum</i> , <i>Carex</i> spp and <i>Pedicularis sylvatica</i> .
28	312855	599289	Plantation with block (or scattered) pines with much bracken or local <i>Juncus effusus</i> (and pasture).
29	312822	599162	Heavily drained mire in valley bottom (drains very recent) with much <i>Juncus acutiflorus</i> , some in dominant flush zones but much intermediate with flushed acid grassland elements (difficult to code or classify); several of marshy species from flushes up slope to west occur here.
30	312648	599623	Tussocky bog on leveller ground with quite dense cover of <i>Sphagnum</i> (mainly <i>S. fallax</i> and <i>S. capillifolium</i> ).
31	312869	599793	Wetter bog with much <i>Sphagnum</i> (much <i>S. fallax</i> ) with <i>Polytrichum commune</i> ; drying as rises to wall corner.
32	312989	599577	Deeply drained relic with abundant <i>Sphagnum</i> (much <i>S. papillosum</i> ) plus

			<i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Narthecium ossifragum</i> .
33	313021	599437	Small patch of short pasture with much <i>Juncus effusus</i> but otherwise mostly wet acid grassland <i>Juncus squarrosus</i> and mosses plus <i>Agrostis canina</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> etc. (and <i>Eriophorum vaginatum</i> bog to north)
34	313147	599324	Leveller ground above with wetter bog, locally thick <i>Sphagnum</i> carpet (much <i>S. fallax</i> ) and <i>Polytrichum commune</i> and <i>Juncus squarrosus</i> ; tussocky <i>Eriophorum vaginatum</i> (with <i>Vaccinium myrtillus</i> and <i>Pleurozium schreberii</i> ) but only occasional short <i>Calluna vulgaris</i> .
35	313201	599202	Broad shallow valley with drained bog now dominated by rather species poor <i>Juncus acutiflorus</i> ( <i>Cirsium palustre</i> , <i>Rumex acetosa</i> and <i>Viola palustris</i> ) and some wet acid grassland elements (but few bog species).
36	313319	599041	Low-lying area with bog pool-type cover with much <i>Sphagnum papillosum</i> plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Vaccinium oxycoccos</i> and <i>Drosera rotundifolia</i> .
37	313621	598796	Bracken becoming very dense.
38	313653	598796	Small open areas of pasture or <i>Juncus acutiflorus</i> but otherwise dense bracken.
39	313649	598850	Steep-sided burn with some ferns and pasture, plus more or less continuous line of scrub wood (rowan with willow).
40	313726	598829	Local patches of acid grass some with short grazed heath relics.
41	313551	598989	Lower slope with increased <i>Eriophorum vaginatum</i> relics and locally frequent <i>Sphagnum</i> plus some <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> (wet heath affinities).
42	313464	599158	Long strip of wet bog mire below two embankments; much <i>Sphagnum fallax</i> plus <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> and <i>Carex nigra</i> .
43	313363	599156	Local block of mire with more prominent <i>Eriophorum vaginatum</i> and some <i>Sphagnum</i> ; grades to <i>Juncus squarrosus</i> acid grassland.
44	313719	599350	Steep slope with extensive short grassland but much dominated by bracken (or various intermediate stages); mossy with <i>Hylocomium splendens</i> , <i>Scleropodium purum</i> , <i>Rhytidiadelphus squarrosus</i> , and occasional short <i>Galium saxatile</i> , <i>Oxalis acetosella</i> , <i>Viola riviniana</i> , <i>Rumex acetosa</i> and <i>Potentilla erecta</i> .
45	313664	599424	Narrow flush with <i>Nardus stricta</i> and <i>Molinia caerulea</i> plus <i>Carex</i> spp., <i>Briza minor</i> and <i>Palustriella falcata</i> .
46	313641	599452	Grassland locally more acidic (some <i>Pleurozium schreberi</i> and occasional short heather).
47	313459	599400	<i>Juncus acutiflorus</i> flushing with <i>Carex</i> spp., <i>Calliergonella cuspidata</i> and small spring with <i>Cratoneuron commutatum</i> .
48	313416	599437	Shallow peat edge with <i>Juncus effusus</i> strip but with acid grass pasture below.
49	313400	599445	Boggy slope with occasional <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , some <i>Sphagnum</i> , <i>Deschampsia flexuosa</i> and <i>Juncus squarrosus</i> .
50	313229	599431	Small depression with much <i>Sphagnum fallax</i> plus <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum commune</i> , plus some <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> .
51	313357	599527	Coarser acid grassland on slope here with abundant <i>Polytrichum commune</i> , and some <i>Molinia caerulea</i> .
52	313613	599483	Short grazed heath relic (some <i>Erica cinerea</i> ).
53	313600	599481	Small burn with gravelly flushing ( <i>Calliergonella cuspidata</i> , <i>Juncus</i> spp., <i>Ranunculus acris</i> , <i>Lysimachia nemorum</i> , <i>Prunella vulgaris</i> ).
54	313534	599557	Local heather with <i>Blechnum spicant</i> , <i>Carex binervis</i> , <i>Festuca ovina</i> and <i>Hylocomium splendens</i> .
55	313512	599578	Narrow flush ( <i>Juncus acutiflorus</i> ) with some short grazed <i>Filipendula ulmaria</i> .

56	313508	599608	Flush with some <i>Molinia caerulea</i> plus <i>Calliergonella cuspidata</i> , <i>Carex</i> spp., <i>Lysimachia nemorum</i> , <i>Filipendula ulmaria</i> (short) and <i>Cirsium palustre</i> .
57	313415	599738	Sloping hillside with dense cover of shrubby heather (40cm+) with <i>Vaccinium myrtillus</i> , occasional <i>Erica cinerea</i> , few grasses, <i>Blechnum spicant</i> and mosses include abundant <i>Hylocomium splendens</i> , with <i>Pleurozium schreberi</i> , <i>Breutelia chrysocoma</i> and <i>Dicranum scoparium</i> .
58	313306	599719	Flushing with frequent <i>Molinia</i> but also much <i>Vaccinium myrtillus</i> and heather; mosses include frequent <i>Polytrichum commune</i> .
59	313251	599719	Open grassy glade ( <i>Molinia</i> and bracken to margins) with short-grazed but quite broad-leaved grasses ( <i>Holcus lanatus</i> and <i>Dactylis glomerata</i> ).
60	313187	599761	Upper slope with increased <i>Molinia</i> plus <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> .
61	313156	599727	Increasing <i>Eriophorum vaginatum</i> with heather plus <i>Molinia</i> , <i>Vaccinium</i> (some <i>V. vitis-idaea</i> ), <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and <i>Sphagnum capillifolium</i> .
62	313023	599725	Drier ridge with <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and some <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> ; depression below with much <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> and <i>Carex nigra</i> .
63	312965	599845	Gentler slope above steep heather domination but now with increased <i>Molinia caerulea</i> , <i>Eriophorum vaginatum</i> and occasional <i>Sphagnum capillifolium</i> .
64	312870	599863	Dramatic contrast east of the wall compared to grazed <i>Eriophorum vaginatum</i> bog to west side. The ridge undulates with a more wet heath type domination to higher ground: mostly <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Molinia caerulea</i> but some <i>Eriophorum vaginatum</i> plus <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> . Lower depressions though have increased <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> , and often more frequent <i>Molinia caerulea</i> .
65	312917	599883	Steepening slope with <i>Calluna vulgaris</i> dominating plus <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
66	312957	599961	Narrow flushed bank between heather dominated steep slope and burn embankment; <i>Molinia</i> and <i>Juncus</i> frequent but locally diverse with <i>Carex</i> spp., <i>Ajuga reptans</i> , <i>Potentilla sterilis</i> and <i>Anemone nemorosa</i> .
67	312983	599985	Burn valley with bracken and heather to steep slopes, rare scrub (rowan, willow and hawthorn), ferns (some <i>Dryopteris affinis</i> and <i>Equisetum sylvaticum</i> ) plus herbs such as <i>Oxalis acetosella</i> , <i>Luzula pilosa</i> and <i>Viola riviniana</i> .
68	313091	600086	Small area, difficult to map or classify, but with some relic wet heath (or bog) elements, <i>Eriophorum vaginatum</i> but also <i>Carex</i> species, acid grassland elements and bracken.
69	313295	599947	Broad valley with open grassland, gravels, flushes, bracken and developing scrub woodland (grey and eared willows, and hybrid, plus hawthorn, rowan and some birch, and a couple of pines); species diversity high with <i>Holcus mollis</i> , <i>Digitalis purpurea</i> , <i>Teucrium scorodonia</i> , <i>Hypericum pulchrum</i> , <i>Primula vulgaris</i> , <i>Stellaria holostea</i> , <i>Galium verum</i> , <i>Thymus polytrichus</i> <i>Pilosella officinarum</i> , <i>Potentilla sterilis</i> , <i>Carex laevigata</i> and <i>Pimpinella saxifraga</i> .
70	313541	600158	Rock outcrop with much <i>Erica cinerea</i> heath plus <i>Teucrium scorodonia</i> , <i>Dryopteris affinis</i> , <i>Blechnum spicant</i> and some <i>Chamerion angustifolium</i> and mosses include <i>Racomitrium aquaticum</i> , <i>Andreaea</i> sp., <i>Campylopus atrovirens</i> and one area with flushed <i>Sphagnum palustre</i> . Scree below with more <i>Cryptogramma crispa</i> .
71	313565	600160	Scree with much <i>Racomitrium lanuginosum</i> and sparse <i>Cryptogramma crispa</i> .
72	313695	600171	Boggy strip spills down slope but now with much <i>Molinia caerulea</i> (with <i>Vaccinium myrtillus</i> and some <i>Eriophorum vaginatum</i> ); becoming more ( <i>Molinia</i> ) wet heath like

			below.
73	313694	600439	Narrow strip of bog relic parallel with fence but with only sparse <i>Eriophorum vaginatum</i> ; some <i>Vaccinium vitis-idaea</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> and <i>Empetrum nigrum</i> .
74	313759	600628	Bog with much <i>Vaccinium myrtillus</i> and frequent <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> and local <i>Sphagnum</i> , but scarce <i>Calluna vulgaris</i> ; abundant spruce colonists.
75	313769	600700	Narrow summit ridge, level, with very tussocky relic bog (peat c. 40cm) but also dominated by <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> , and hypnoid mosses, but with occasional <i>Eriophorum vaginatum</i> and some <i>Sphagnum</i> ; other species include <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , and more sparingly <i>Juncus squarrosus</i> , <i>Empetrum nigrum</i> and <i>Trichophorum germanicum</i> (some spruce invasives).
76	313655	600783	Heather dominated slope but here (and extending up to crest further north) <i>Molinia caerulea</i> becoming frequent but vegetation otherwise similar to rest of slope.
77	313555	600824	Strip of grassland up slope but above dense dry heath dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses; some <i>Lycopodium clavatum</i> (but seemingly very rare).
78	313530	600859	Gravelly stream bed with short grassland plus some flushes and bracken zones; diverse species include <i>Thymus polytrichus</i> , <i>Equisetum sylvaticum</i> , <i>Tussilago farfara</i> and <i>Carex laevigata</i> .
79	313398	600962	Small flush and open scree with (rare <i>Cryptogramma crispa</i> ) in otherwise dense bracken cover; some <i>Thymus polytrichus</i> and <i>Campanula rotundifolia</i> to grassy margins.
80	313855	600953	Locally increased <i>Molinia caerulea</i> .
81	313880	601048	Narrow strip of bog vegetation extends as a 10m strip parallel to fence; <i>Vaccinium myrtillus</i> abundant with some <i>Eriophorum vaginatum</i> (but scarce) plus <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberi</i> with occasional <i>Erica tetralix</i> , <i>Calluna vulgaris</i> and some <i>Sphagnum capillifolium</i> .
82	313765	601337	Steep sided gully with scree supporting some <i>Thymus polytrichus</i> , <i>Pilosella officinarum</i> , <i>Viola riviniana</i> , <i>Potentilla sterilis</i> and, in flushes, <i>Chrysosplenium oppositifolium</i> and <i>Cochlearia officinalis</i> .
83	313879	601361	Lower slopes dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> with <i>Pleurozium schreberi</i> , <i>Hypnum jutlandicum</i> , <i>Dicranum scoparium</i> , and occasional wet heath or bog element ( <i>Erica tetralix</i> , <i>Eriophorum</i> spp., <i>Vaccinium vitis-idaea</i> ).
84	313554	601452	Extensive steep hillside dominated by <i>Calluna vulgaris</i> but with locally much <i>Vaccinium myrtillus</i> (some with <i>Erica tetralix</i> and <i>Molinia caerulea</i> ) plus <i>Deschampsia flexuosa</i> marking local grassy patches.
85	313879	601536	Bog spill parallel fence with some <i>Eriophorum vaginatum</i> (and local <i>E. angustifolium</i> ); peat locally deep (40cm).
86	313840	601641	Summit area with extensive cover of blanket bog: <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> plus <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Juncus squarrosus</i> , <i>Deschampsia flexuosa</i> , <i>Hypnum jutlandicum</i> and some <i>Sphagnum capillifolium</i> (local spruce colonists).
87	313862	601751	Bog continues east of fence on slope to plantation, with occasionally high heather domination but generally similar blanket bog cover.
88	313789	601761	Heather dominating on steepening slope (occasional <i>Eriophorum vaginatum</i> ) with <i>Vaccinium myrtillus</i> , <i>V. vitis-idaea</i> , <i>Juncus squarrosus</i> and occasional <i>Sphagnum capillifolium</i> patch and even some <i>Leucobryum glaucum</i> .
89	313829	601820	<i>Eriophorum</i> increases to north but otherwise similar <i>Calluna</i> – <i>Eriophorum</i> bog (peat not deep though) with <i>Juncus squarrosus</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum</i>



			angustifolium, and <i>Trichophorum germanicum</i> .
90	313697	601873	Mossy <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Hypnum jutlandicum</i> and <i>Pleurozium schreberi</i> , with some <i>Sphagnum capillifolium</i> , <i>Plagiothecium undulatum</i> and <i>Lophozia ventricosa</i> .
91	313816	602020	Extensive <i>Calluna vulgaris</i> - <i>Eriophorum vaginatum</i> bog with occasional <i>Sphagnum capillifolium</i> and <i>Pleurozium schreberi</i> , plus <i>Vaccinium myrtillus</i> , <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Juncus squarrosus</i> and <i>Hypnum jutlandicum</i> (peat c. 25cm).
92	313785	602104	Increased <i>Calluna vulgaris</i> here, more dry heath appearance, with <i>Vaccinium</i> spp., <i>Pleurozium schreberi</i> , <i>Hypnum jutlandicum</i> and <i>Dicranum scoparium</i> .
93	313609	602038	Narrow flush below bog with some <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> , but increasingly <i>Juncus effusus</i> below with <i>Carex echinata</i> , <i>Viola palustris</i> and some <i>Cardamine pratensis</i> .
94	313585	601952	Valley head with bog spill, dry and wet heath and some open (or flushed) grassy areas; <i>Juncus acutiflorus</i> with <i>Holcus mollis</i> , and some flushed <i>Nardus stricta</i> grassland (with <i>Carex binervis</i> ).
95	313434	601917	Grassland patches (some flushed) but here with <i>Potentilla sterilis</i> , <i>Viola riviniana</i> , <i>Ranunculus acris</i> , <i>Veronica chamaedrys</i> and <i>Galium verum</i> .
96	313341	601779	Hill slope with some grassy but frequently flushed and very diverse: <i>Holcus mollis</i> , <i>Ajuga reptans</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> , <i>Carex flacca</i> , <i>C. panicea</i> , <i>C. echinata</i> , <i>Galium uliginosum</i> , <i>Filipendula ulmaria</i> , <i>Lysimachia nemorum</i> , <i>Epilobium palustre</i> , <i>Succisa pratensis</i> and mosses include <i>Calliergonella cuspidata</i> and <i>Philonotis fontana</i> .
97	313424	601610	Local flush with <i>Juncus acutiflorus</i> and some <i>Nardus stricta</i> ; associates include <i>Carex laevigata</i> , <i>Ajuga reptans</i> , <i>Carex flacca</i> , <i>C. nigra</i> , <i>Filipendula ulmaria</i> and <i>Lathyrus pratensis</i> .
98	313438	601608	Narrow steep valley with rock outcrop here (rare rowan with ferns <i>Dryopteris affinis</i> and <i>Oreopteris limbosperma</i> ); diverse flora with some <i>Thymus polytrichus</i> , <i>Luzula sylvatica</i> , <i>Hypericum pulchrum</i> , <i>Oxalis acetosella</i> , <i>Crepis paludosa</i> etc.; bryophytes also diverse with <i>Sphagnum squarrosum</i> , <i>S. subnitens</i> , <i>Breutelia chryscoma</i> , <i>Bryum pseudotriquetrum</i> , <i>Dicranella palustris</i> , <i>Scapania</i> and <i>Hygrohypnum</i> sp.
99	313272	601640	Wet bog spill continues over fence but with little <i>Calluna vulgaris</i> and more <i>Vaccinium myrtillus</i> plus some <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Deschampsia flexuosa</i> and <i>Pleurozium schreberi</i> .
100	312619	599686	Small ridge with bracken with <i>Holcus mollis</i> and small population of <i>Hyacinthoides non-scripta</i> .
101	312451	599689	Flushes with locally high species diversity <i>Ajuga reptans</i> , <i>Lysimachia nemorum</i> , <i>Carex pulicaris</i> and <i>Carex laevigata</i> .
102	312311	599811	Broad valley mire with much <i>Juncus acutiflorus</i> plus <i>Molinia caerulea</i> , <i>Carex</i> spp., <i>Galium uliginosum</i> and <i>Narthecium ossifragum</i> ; more enriched further below more with some <i>Holcus lanatus</i> and <i>Deschampsia cespitosa</i> .
103	312274	599861	Relic graminoid wet heath (but very mire like) with abundant <i>Molinia caerulea</i> with <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Agrostis canina</i> , <i>Carex echinata</i> , <i>Deschampsia flexuosa</i> and some <i>Dactylorhiza maculata</i> .
104	312242	599909	Deep peat here with some <i>Eriophorum vaginatum</i> , but much <i>Sphagnum</i> , but mostly grassy with <i>Agrostis canina</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> with <i>Polytrichum commune</i> and <i>Erica tetralix</i> .
105	312536	599957	Steep embankment with locally much bracken and some areas of dry heath ( <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Luzula pilosa</i> , <i>Deschampsia flexuosa</i> and occasional <i>Erica cinerea</i> ).

106	312735	599924	Large area marked by increased <i>Eriophorum vaginatum</i> (and other wet heath dominants) plus a little <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and <i>Sphagnum capillifolium</i> .
107	312829	600040	Small valley with short grassland, bracken and rush zones; locally diverse with <i>Ajuga reptans</i> , <i>Holcus mollis</i> , <i>Equisetum sylvaticum</i> and <i>Carex laevigata</i> .
108	312534	600097	Local patch of heath and some scree patches (some <i>Racomitrium lanuginosum</i> moss and <i>Sphaerophorus</i> lichen); <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Deschampsia flexuosa</i> , <i>Carex pilulifera</i> , occasional <i>Erica cinerea</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
109	312608	600138	Gentler slopes with tussocky wet heath dominated by <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and <i>Molinia caerulea</i> (the latter being chief separation from drier heath on steeper slopes).
110	312617	600231	Level area with patch of wet heath but with some bog elements ( <i>Eriophorum vaginatum</i> and a little <i>Sphagnum</i> - but not much).
111	312623	600294	Long flush down slope and feeding narrow gully with abundant <i>Molinia caerulea</i> ; tussocky and with some <i>Vaccinium myrtillus</i> indicating wet heath affinities (rather than mire).
112	312405	600154	Flushing with <i>Carex</i> spp., plus <i>Nardus stricta</i> and some <i>Briza media</i> .
113	312335	600188	Flushed acid grassland with much <i>Carex panicea</i> and <i>C. flacca</i> plus <i>Molinia caerulea</i> , <i>Juncus bulbosus</i> and <i>Briza media</i> .
114	312305	600202	Species rich flushed grassland and <i>Juncus acutiflorus</i> mire: <i>Carex laevigata</i> , <i>Galium palustre</i> , <i>G. uliginosum</i> , <i>Viola palustris</i> , <i>Cirsium palustre</i> , and some more acidic flushing with <i>Nardus stricta</i> and <i>Narthecium ossifragum</i> .
115	312235	600262	Long narrow <i>Juncus effusus</i> (mostly) flush through sea of bracken; rich associates include <i>Lysimachia nemorum</i> , <i>Ranunculus flammula</i> , <i>Potentilla sterilis</i> , <i>Carex pulicaris</i> , <i>C. demissa</i> , <i>C. flacca</i> , <i>Galium uliginosum</i> , <i>Juncus conglomeratus</i> and locally some <i>Dactylorhiza maculata</i> .
116	312827	600405	Strip dominated by <i>Vaccinium myrtillus</i> , with much <i>Pleurozium schreberii</i> and <i>Deschampsia flexuosa</i> but limited <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Molinia caerulea</i> .
117	312781	600469	Leveller area with increased <i>Eriophorum vaginatum</i> plus much <i>Pleurozium schreberi</i> with <i>Calluna vulgaris</i> , <i>Deschampsia flexuosa</i> and <i>Erica tetralix</i> .
118	312369	600553	Rocks and scree exposures in other heather dominated hillside; frequent <i>Teucrium scorodonia</i> below crags and scree with <i>Racomitrium lanuginosum</i> and <i>Sphaerophorus</i> lichen; other species include hazel, honeysuckle, <i>Dryopteris oreades</i> and <i>Veronica officinalis</i> .
119	312518	600566	Upper slope with heather dominated cover but few bog relic elements (very scarce <i>Eriophorum</i> ) with much <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> but few other associates noted.
120	312508	600688	Extensive steep hillside dominated by <i>Calluna vulgaris</i> , with frequent <i>Vaccinium myrtillus</i> and much <i>Pleurozium schreberi</i> and other mosses such as <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> and <i>Dicranum scoparium</i> , plus rarely <i>Dryopteris dilatata</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium vitis-idaea</i> , <i>Rhytidiadelphus loreus</i> and very rarely <i>Eriophorum vaginatum</i> .
121	312732	600621	Heather dominated slope but locally with wet heath or bog elements but few of the latter; here an old drain (or track?) feeding flushed valley, with much <i>Trichophorum germanicum</i> and <i>Eriophorum vaginatum</i> .
122	312682	600706	Level plateau with peat c. 20cm deep with a blanket bog cover: <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> and <i>Pleurozium schreberii</i> common with <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> , <i>Deschampsia flexuosa</i> , <i>Rhytidiadelphus squarrosus</i> but little <i>Sphagnum</i>

			(rare hollows, and even rare hummocks).
123	312847	600873	Upper burn head with often intermediate heath or bog relic spill vegetation (peat quite deep in place but <i>Eriophorum vaginatum</i> scarce to local); central flush with more <i>Eriophorum</i> plus <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Narthecium ossifragum</i> , <i>Pleurozium schreberii</i> , <i>Polytrichum commune</i> and some <i>Sphagnum</i> (rare <i>S. papillosum</i> ).
124	312866	600989	Extensive blanket bog on summit ridge (but peat no very deep) with much <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> and <i>Pleurozium schreberii</i> with local <i>Vaccinium myrtillus</i> , plus <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus loreus</i> and <i>Hypnum jutlandicum</i> (some spruce colonists).
125	312722	601002	Broad bog spill (peat c. 20cm deep) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> prominent plus rare to occasional <i>Erica tetralix</i> , <i>Vaccinium vitis-idaea</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum capillifolium</i> .
126	312644	600924	More distinct, but diffuse, big spill to here; occasional to frequent <i>Eriophorum vaginatum</i> with some <i>Sphagnum capillifolium</i> and <i>Molinia caerulea</i> , but still much <i>Calluna</i> and <i>Vaccinium</i> .
127	313090	601027	Extensive tussocky dry blanket bog (peat c. 30cm) with much <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> , plus <i>Vaccinium vitis-idaea</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Empetrum nigrum</i> , <i>Molinia caerulea</i> , <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> but seemingly little <i>Sphagnum</i> , and some scattered spruce colonists.
128	312372	601145	Leveller ground below steep slope (peat c. 30cm) with frequent <i>Eriophorum vaginatum</i> plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , with occasional <i>Sphagnum capillifolium</i> , <i>Empetrum nigrum</i> and <i>Trichophorum germanicum</i> ; <i>Eriophorum</i> decreases as hill slope steepens but <i>Molinia</i> persists.
129	312686	601179	Local area with increased <i>Vaccinium myrtillus</i> and decreased <i>Calluna vulgaris</i> , plus <i>Molinia caerulea</i> , <i>Empetrum nigrum</i> , <i>Erica tetralix</i> and some <i>Eriophorum vaginatum</i> (mainly above).
130	312821	601250	Local areas with some <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> and <i>Vaccinium vitis-idaea</i> but no <i>Eriophorum vaginatum</i> (except up slope); peat c. 30cm deep.
131	313015	601272	Bog spill but with little <i>Eriophorum vaginatum</i> here but some other bog relics ( <i>Empetrum nigrum</i> , <i>Vaccinium</i> spp., <i>Molinia caerulea</i> and <i>Pleurozium schreberii</i> ) but mostly dry <i>Calluna vulgaris</i> dominated. Some local wet heath patches and occasional bog spills.
132	313140	601313	Small flush in slight valley (dry heath lined) with increased graminoids ( <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> ); near fence very wet mire with <i>Sphagnum</i> carpet (some <i>S. papillosum</i> ) plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , and <i>Aulacomnium palustre</i> .
133	313141	601438	Broad ridge on gentle slope or level (peat 30+cm); <i>Calluna vulgaris</i> and <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> plus <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Rhytidiadelphus</i> spp but scarce <i>Sphagnum capillifolium</i> .
134	312794	601499	Steep sided burn (and feeders) with a very rich (but compact) diversity with <i>Teucrium scorodonia</i> , <i>Thymus polytrichus</i> , <i>Erica cinerea</i> , <i>Lathyrus linifolius</i> , <i>Hieracium vulgatum</i> , <i>Linum catharticum</i> , <i>Selaginella selaginoides</i> , <i>Galium sternerii</i> and <i>Rubus saxatilis</i> .

135	312717	601624	Wet acidic grassland below rush flush with <i>Carex</i> spp and some <i>Juncus bulbosus</i> and <i>J. articulatus</i> . Also stand of <i>Cirsium arvense</i> invading from below. Bracken increasingly dominant to drier grassy (and heathy) surrounds.
136	312730	601688	<i>Juncus acutiflorus</i> flushes feeding small gully (heather with <i>Oreopteris limbosperma</i> ); <i>Filipendula ulmaria</i> , <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> (some double-flowered) and rare <i>Carex laevigata</i> .
137	312944	601598	Large area of open grassland below, some quite acidic, with local <i>Nardus stricta</i> ; flushes here with <i>Anemone nemorosa</i> , <i>Valerian dioica</i> , <i>Carex flacca</i> , <i>Galium verum</i> , <i>Lathyrus pratensis</i> and <i>Equisetum arvense</i> .
138	313008	601615	Large area of <i>Molinia</i> dominated vegetation (with wet heath elements) about old drain, feeding flushes below ( <i>Succisa pratensis</i> , <i>Cardamine pratensis</i> and <i>Valeriana dioica</i> ).
139	313156	601669	Tussocky dry bog with much <i>Calluna vulgaris</i> and <i>Pleurozium schreberi</i> though <i>Eriophorum vaginatum</i> often scattered; plus some <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and occasional <i>Sphagnum capillifolium</i> .
140	313106	601684	Increased <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> (on deep peat) with scattered <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> , <i>Pleurozium schreberii</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
141	312937	601741	Increased <i>Calluna vulgaris</i> but with occasional <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> and peat c. 25cm (intermediate wet and dry heath).
142	312766	601845	Central leveller area with much <i>Eriophorum vaginatum</i> (but also extending up or down the margins of the hill slope), with <i>Molinia caerulea</i> and some <i>Sphagnum</i> (very rare <i>S. papillosum</i> noted) but also drier <i>Calluna vulgaris</i> and <i>Deschampsia flexuosa</i> ; intermediate wet heath and bog relic.
143	312858	601920	Leveller strip wit increased <i>Eriophorum vaginatum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> and <i>Sphagnum capillifolium</i> ; peat c. 25cm deep.
144	313132	601792	Heather dominated but with <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> and <i>Pleurozium schreberii</i> but <i>Eriophorum vaginatum</i> now rare (peat c. 30cm though); some <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> and <i>Rhytidiadelphus squarrosus</i> .
145	313238	601885	Small bog pool ( <i>Eriophorum angustifolium</i> and <i>Sphagnum papillosum</i> ); bog here with a little more <i>Sphagnum</i> plus <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
146	313018	602005	<i>Juncus acutiflorus</i> dominated flush (locally wet acid grassland with <i>Carex</i> spp.); <i>Carex hostiana</i> , <i>C. pulicaris</i> , <i>C. echinata</i> , <i>Taraxacum</i> sp., <i>Viola palustris</i> , <i>Ajuga reptans</i> , <i>Poa trivialis</i> , <i>Prunella vulgaris</i> and <i>Cardamine pratensis</i> .
147	313118	602050	Broad leveller area on otherwise steep slope; here with some flushed acid grassland ( <i>Carex</i> spp.) plus wet heath elements including locally much <i>Molinia caerulea</i> .
148	313895	602285	Small flush with <i>Sphagnum papillosum</i> and <i>Aulacomnium palustre</i> .
149	313885	602298	Level area of bog but with reduced <i>Eriophorum vaginatum</i> but frequent <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> and some <i>Rubus chamaemorus</i> .
150	313923	602400	Rising ground but little <i>Eriophorum vaginatum</i> ; <i>Calluna vulgaris</i> dominated with <i>Vaccinium</i> spp., <i>Eriophorum angustifolium</i> , <i>Pleurozium schreberi</i> and <i>Hypnum jutlandicum</i> but little <i>Sphagnum capillifolium</i> ; some <i>Melampyrum pratense</i> near fence.
151	313992	602460	Hill slope with extensive domination by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> plus <i>Pleurozium schreberii</i> , <i>Hypnum jutlandicum</i> , plus occasional <i>Molinia caerulea</i> , <i>Erica tetralix</i> and very rare <i>Eriophorum vaginatum</i> .
152	314098	602449	Broad strip to forest edge with (north of here) much <i>Molinia caerulea</i> plus some <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Nardus stricta</i> ; similar to south



			but mixed with wet acid grassland and some bog or heath elements.
153	314066	602554	Leveller ridge about fence junction with distinct boggy relics (much <i>Eriophorum vaginatum</i> ; some <i>Melampyrum pratense</i> noted).
154	313971	602547	Grassy glades in otherwise dense heather domination; <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> , <i>Festuca ovina</i> , <i>Juncus squarrosus</i> , <i>Potentilla erecta</i> , <i>Galium saxatile</i> but with <i>Vaccinium</i> spp, and often much <i>Polytrichum commune</i> .
155	314278	602527	Extensive domination by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> and <i>Hypnum jutlandicum</i> , plus local <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> , <i>Juncus squarrosus</i> , and very rarely <i>Empetrum nigrum</i> , <i>Trichophorum germanicum</i> and <i>Eriophorum</i> spp. Peat c. 20cm deep. Some <i>Carex bigelowii</i> noted (but rare).
156	314252	602571	Small scattered islets with bog relics: <i>Eriophorum</i> spp., plus more <i>Empetrum</i> and <i>Vaccinium</i> spp.
157	314233	602597	Ridge about fence supporting more boggy elements but often small patches or diffuse <i>Eriophorum</i> spp., <i>Trichophorum germanicum</i> , <i>Empetrum nigrum</i> , <i>Juncus squarrosus</i> etc. but peat seems shallow; some <i>Rubus chamaemorus</i> noted.
158	314167	602578	Similar appear heathy vegetation but here with more <i>Eriophorum vaginatum</i> and some mossy hummocks (but scarce <i>Sphagnum capillifolium</i> ) with mostly rare <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium vitis-idaea</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> .
159	314055	602682	Steep slope dominated by heather but locally with increased <i>Vaccinium myrtillus</i> (often above) and locally damper with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Polytrichum commune</i> and some <i>Sphagnum capillifolium</i> ; below and to northwest several patches of acid grass (some intermediate or mosaics).
160	314192	602793	Grassy glades extending up steep slope with <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> , <i>Festuca ovina</i> , <i>Galium saxatile</i> , <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> ; some (rare?) <i>Carex bigelowii</i> .
161	314360	602894	Locally much increased <i>Vaccinium myrtillus</i> (and some high cover of <i>V. vitis-idaea</i> ), plus acidic grassy glades.

#### Target notes for main central area with Laverhay Height and Milne Height

1	318052	593944	Local ridge with bracken on slope otherwise short grazed somewhat enriched bent fescue pasture (some <i>Viola lutea</i> ).
2	318026	594110	Relic graminoid wet heath or bog with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> .
3	317924	594132	Slope with wet grassland and much <i>Molinia caerulea</i> with some <i>Carex nigra</i> and <i>Juncus squarrosus</i> , and occasional <i>Eriophorum vaginatum</i> .
4	317942	594181	Small patch of <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> plus <i>Vaccinium myrtillus</i> (and <i>Nardus stricta</i> , <i>Carex binervis</i> acid grassland).
5	317729	593829	Steep ridge with bracken below; to south a series of ridges and hillocks with mosaic of bracken and short grassland.
6	317722	593841	Historical ground works, with some acidic grassland (local <i>Juncus squarrosus</i> ) and marshy to centre; bracken to steeper embankment below.
7	317631	593822	Enriched short grazed pasture down undulating slope (steeper ridges less enriched, and locally with bracken); also occasional flush line with <i>Juncus effusus</i> (plus <i>Calliergonella cuspidata</i> , <i>Ranunculus</i> spp., <i>Carex</i> spp., <i>Deschampsia cespitosa</i> and <i>Cynosurus cristatus</i> ).
8	317775	594064	Band of more acidic and poorly draining grassland ( <i>Nardus stricta</i> , <i>Molinia caerulea</i> )

			with much moss ( <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> ) extends down slope terminating in <i>Juncus effusus</i> patch.
9	317671	594066	Strip of wet acid grassland ( <i>Agrostis canina</i> , <i>Molinia</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> etc).
10	317689	594124	Steep slope with acidic grassland (some intermediate between U5 and U4) with <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Nardus stricta</i> , <i>Carex binervis</i> , rare <i>Calluna vulgaris</i> , and mosses include <i>Hylocomium splendens</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Polytrichum commune</i> .
11	317542	594094	Acid grassland with increasing heath elements ( <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> ).
12	317517	594091	Grassy flush below <i>Juncus effusus</i> with some bog elements ( <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> spp. (some <i>S. papillosum</i> ), <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> ).
13	317498	593990	Boggy relics parallel to <i>Juncus effusus</i> mire about drain; <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Nardus stricta</i> , <i>Sphagnum capillifolium</i> and other mosses.
14	317470	593956	<i>Juncus</i> mire in shallow valley with freer draining slopes to embankments; locally with boggy relic by flushes with <i>Eriophorum vaginatum</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> and some <i>Sphagnum capillifolium</i> .
15	317355	593795	Small valley with <i>Juncus acutiflorus</i> marsh with <i>Ranunculus</i> spp., <i>Calliergonella cuspidata</i> , <i>Veronica beccabunga</i> , <i>Cardamine pratensis</i> and <i>Lysimachia nemorum</i> .
16	317344	594021	Wet bog relics extend down to, and across, fence with <i>Eriophorum vaginatum</i> but drier with more <i>Juncus squarrosus</i> and <i>Polytrichum commune</i> .
17	317378	594063	Steeper ridge with bog relics giving way to <i>Juncus acutiflorus</i> mire (but more bog below).
18	317442	594121	Slope with frequent <i>Eriophorum vaginatum</i> and other bog or wet heath relics ( <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Rhytidiadelphus loreus</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Sphagnum capillifolium</i> and occasional <i>S. fallax</i> or <i>S. papillosum</i> ).
19	317484	594185	<i>Juncus effusus</i> spills down acid grassland slope, which in general is flushed and wet ( <i>Carex nigra</i> , <i>Deschampsia cespitosa</i> ); below with dense bracken and developing willow scrub.
20	317438	594160	Acid grassland but with much <i>Polytrichum commune</i> , <i>Sphagnum</i> (some <i>S. russowii</i> ), <i>Rhytidiadelphus loreus</i> , <i>Carex nigra</i> , <i>Agrostis canina</i> sl., <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and some short heather.
21	317292	594290	Bog or wet heath relics ( <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and <i>Sphagnum</i> ; bracken dense further below with immature birch wood (north side woodland with more ash).
22	317242	594292	Spring (with some tufa) and bryophytes include <i>Palustriella commutata</i> with <i>Dicranodontium</i> and <i>Drepanocladus</i> spp., plus <i>Selaginella selaginoides</i> , <i>Carex flacca</i> , <i>C. demissa</i> , <i>C. dioica</i> , and <i>Briza media</i> .
23	317226	594300	Burn side rocks with small areas of heather plus some <i>Thymus polytrichus</i> and <i>Pilosella officinarum</i> .
24	317195	594296	Flushed grassland above burn, locally with <i>Palustriella commutata</i> springs.
25	317256	594166	Increasing <i>Eriophorum vaginatum</i> (and some <i>Trichophorum germanicum</i> ) but mostly tussocky wet <i>Nardus</i> type grassland.
26	317350	594144	Leveller area with increased <i>Eriophorum vaginatum</i> and other boggy relics. Grading on slopes to wet acidic grassland (difficult to demarcate).
27	317194	594100	Large relic boggy zone, drained; <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Sphagnum capillifolium</i> , (rare <i>S. papillosum</i> ), <i>Pleurozium schreberi</i> , <i>Aulacomnium</i>



			palustre and <i>Rhytidiadelphus squarrosus</i> .
28	317275	594105	Wet tussocky acid grassland with <i>Eriophorum vaginatum</i> relics.
29	317282	594042	Extensive slope with <i>Nardus stricta</i> grassland with occasional <i>Eriophorum vaginatum</i> relics, <i>Deschampsia flexuosa</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Luzula multiflora</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
30	317194	594048	Acid grassland but with some wet heath relics (occasional <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> and <i>Sphagnum</i> ).
31	317302	593980	Wetter mire with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , some short <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum fallax</i> (abundant), <i>S. cuspidatum</i> , <i>S. capillifolium</i> , <i>Aulacomnium palustre</i> and <i>Rhytidiadelphus loreus</i> .
32	317283	593975	Shallow depression between ridges with relic tussocky bog: <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , some <i>Vaccinium myrtillus</i> and <i>Calluna vulgaris</i> , and much moss with <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium palustre</i> and <i>Sphagnum capillifolium</i> . Peat c. 20cm deep.
33	317244	593933	Wet mire area with <i>Sphagnum fallax</i> and <i>Carex nigra</i> .
34	317195	593943	Drained boggy depression with several cells of relic bog vegetation (peat c. 30cm deep) <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>S. cuspidatum</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Pleurozium schreberi</i> .
35	317178	593978	Relic graminoid bog (with wet <i>Nardus</i> grassland): <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , some <i>Erica tetralix</i> , and much moss <i>Sphagnum capillifolium</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> (peat c. 25cm).
36	317161	593999	Bog relics with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus loreus</i> .
37	317208	593769	Area of mostly improved pasture but with a band of bracken and a few <i>Juncus</i> lined flushes or drains; more acidic grass above.
38	317092	593629	<i>Juncus acutiflorus</i> (with <i>Molinia</i> ) extends up slope; associates as noted from below plus some <i>Carex flacca</i> , <i>Juncus conglomeratus</i> , <i>Lathyrus pratensis</i> and <i>Plagiomnium undulatum</i> (indicating less acidic conditions).
39	317032	593698	Narrow burn below steep hillside with <i>Juncus effusus</i> and species include <i>Veronica beccabunga</i> , <i>Ranunculus repens</i> , <i>Glyceria fluitans</i> and <i>Callitriche stagnalis</i> .
40	317073	593804	Marsh broadening in leveller valley; <i>Juncus acutiflorus</i> with <i>Ranunculus repens</i> , <i>Stellaria alsine</i> and <i>Callitriche stagnalis</i> and some short grazed <i>Filipendula ulmaria</i> .
41	316989	593881	Local <i>Juncus squarrosus</i> to margin of <i>Juncus</i> flushing.
42	316983	593941	Further boggy zone (c. 25cm deep peat) with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>E. angustifolium</i> , <i>Carex nigra</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum capillifolium</i> , some <i>S. papillosum</i> , <i>Polytrichum commune</i> and <i>Aulacomnium palustre</i> .
43	317078	593991	Central <i>Juncus acutiflorus</i> flush down shallow valley with <i>Juncus effusus</i> to west side.
44	316946	593992	Boggy relic with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Vaccinium oxycoccos</i> .
45	316941	594000	Small ridge of <i>Nardus</i> grassland separating bog relics.
46	316909	594014	Towards wall bog more mire-like ( <i>Sphagnum</i> ) with increasing <i>Juncus effusus</i> .
47	316927	594042	Boggy relic (c. 40cm deep peat) with sparse <i>Eriophorum vaginatum</i> plus <i>Calluna</i>

			<i>vulgaris</i> , <i>Sphagnum capillifolium</i> , <i>S. cuspidatum</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> .
48	316940	594085	Wetter leveller area with much <i>Sphagnum fallax</i> with <i>Carex nigra</i> plus occasional <i>Eriophorum vaginatum</i> and <i>Pleurozium schreberi</i> ; plus <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> , <i>Polytrichum commune</i> , <i>Sphagnum capillifolium</i> and some short <i>Calluna vulgaris</i> .
49	316956	594079	Drier boggy relic with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum capillifolium</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> .
50	317046	594055	Extensive wet acid grassland but with relics of bog precursor, with frequent <i>Eriophorum vaginatum</i> tussocks; locally much <i>Carex nigra</i> with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> etc.
51	317070	594085	Shallow valley with acidic grassland meeting mire below (old drains and flushes complex); grassy <i>Juncus acutiflorus</i> with some <i>Viola palustris</i> , <i>Galium palustre</i> , <i>Ranunculus</i> spp., <i>Cardamine pratensis</i> , <i>Rumex acetosa</i> .
52	317091	594115	<i>Juncus acutiflorus</i> flush (between <i>J. effusus</i> drains/burns, grassy and mossy with some <i>Cardamine pratensis</i> , <i>Ranunculus repens</i> , <i>Holcus lanatus</i> and <i>Calliergonella cuspidata</i> ).
53	317133	594166	Wetter acid grassland: <i>Nardus stricta</i> , <i>Agrostis canina</i> , <i>Deschampsia flexuosa</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> , plus local <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> .
54	317003	594123	Wet <i>Eriophorum vaginatum</i> spills down slope (ending at <i>Juncus effusus</i> lined drain), with <i>Sphagnum</i> , <i>Polytrichum commune</i> , <i>Molinia caerulea</i> .
55	317019	594135	Wetter flushing with <i>Sphagnum fallax</i> abundant plus <i>Polytrichum commune</i> and occasional <i>Eriophorum vaginatum</i> relics.
56	316859	594244	Large patches (and some drain lines) with <i>Juncus effusus</i> (with short turf and mosses).
57	316835	594272	Acid grassland along ridge but local wetter hollow with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> .
58	316725	594571	Short-grazed wet heath extends to fence where taller <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> and tussocky <i>Molinia caerulea</i> ; also stands of <i>Luzula sylvatica</i> on slope (limited scrub but a few rowan).
59	317187	593538	Extensive <i>Juncus</i> (and <i>Molinia</i> ) mire continues with acid grassland elements (more so near drains and higher ridges).
60	316711	593471	Local relic area of wet acidic grassland; <i>Juncus squarrosus</i> with <i>Sphagnum capillifolium</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Aulacomnium palustre</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> and <i>Rhytidiadelphus squarrosus</i> .
61	316721	593489	Old field dyke corner with short pasture all way up to wall above.
62	316628	593438	Boundary between rushy pasture below and short-grazed, better drained pasture, less clear and much intermediate.
63	316562	593471	Local patch of <i>Juncus effusus</i> , with <i>Deschampsia cespitosa</i> .
64	316520	593488	Local area of relic wet acid grassland ( <i>Nardus stricta</i> but frequent much <i>Molinia caerulea</i> ).
65	316446	593573	Plateau between small burns with relic patch of short grazed wet heath: <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Eriophorum</i> spp., <i>Sphagnum capillifolium</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus loreus</i> .
66	316718	593565	Lower slope transition to mire with less improved, wetter pasture ( <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Ranunculus acris</i> , <i>Deschampsia cespitosa</i> ).

67	316645	593673	Drained and tussocky mire edge with <i>Juncus acutiflorus</i> (some <i>Molinia caerulea</i> ) with <i>Cirsium palustre</i> , <i>Ficaria verna</i> , <i>Galium palustre</i> , <i>Cardamine pratensis</i> , <i>Succisa pratensis</i> , <i>Valeriana dioica</i> , <i>Lysimachia nemorum</i> , and mosses include <i>Philonotis fontana</i> , <i>Climacium dendroides</i> , <i>Calliergonella cuspidata</i> .
68	316617	593676	Extensive deep drained rushy mire continues up gentle slopes but with some large grassy patches (often about drains); <i>Juncus acutiflorus</i> common but with local <i>Molinia caerulea</i> , and often <i>Deschampsia cespitosa</i> , plus <i>Cirsium palustre</i> , <i>Cardamine pratensis</i> , <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Ranunculus repens</i> , <i>Ficaria verna</i> and abundant mosses include <i>Rhytidiadelphus squarrosus</i> , <i>Scleropodium purum</i> , <i>Calliergonella cuspidata</i> and <i>Thuidium tamariscinum</i> .
69	316757	593762	Wet marshy grassland about small burn/drain; above more acidic with increasing <i>Nardus stricta</i> .
70	316877	593789	Boggy relic (peat 40 cm deep) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium oxycoccos</i> , <i>Aulacomnium palustre</i> and <i>Rhytidiadelphus loreus</i> .
71	316882	593811	Relic bog with <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Aulacomnium palustre</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Eriophorum angustifolium</i> and <i>Rhytidiadelphus loreus</i> . Peat c. 40cm deep.
72	316865	593837	Relic area of boggy mire (peat c. 30cm) with short grazed <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> ; <i>Sphagnum</i> cover high with <i>S. capillifolium</i> , <i>S. fallax</i> , <i>S. cuspidatum</i> , plus <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> .
73	316841	593948	Small area of <i>Juncus squarrosus</i> (intermediate to bog) and some <i>Juncus effusus</i> drains, and <i>Nardus</i> grassland flushed to hillside slope ( <i>Carex panicea</i> ).
74	316788	593892	Several cells of (drained) relic peat bog (30cm deep) with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> and thick mosses include <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
75	316662	593821	Rough boundary, marked by drains and flushed pasture (some <i>Carex</i> spp.), between rushy pasture below and better drained pasture up hillside above.
76	316502	593782	Local grassy ridges (and drain sides) with less <i>Juncus</i> (and <i>Molinia</i> ).
77	316494	593828	Top deep drain effectively separating drained rushy pasture below from (wet) acid grassland above.
78	316568	593904	Grassland rougher and more tussocky with increased <i>Nardus stricta</i> plus <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Carex nigra</i> , occasional <i>Vaccinium myrtillus</i> and <i>Luzula multiflora</i> .
79	316140	593821	Steep-sided valley with acid grass, ferns (much bracken) and some old ash trees; ground above recently planted with broad-leaved trees.
80	316338	593964	Enriched short grazed pasture, locally more improved but some herb diversity locally (some <i>Viola lutea</i> ).
81	316208	594019	Acid grassland but with locally frequent <i>Molinia caerulea</i> plus <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Anthoxanthum odoratum</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> ; frequent <i>Juncus effusus</i> patches below.
82	316155	594047	Above more acidic pasture with <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Agrostis canina</i> , <i>Polytrichum commune</i> ; below better drained pasture (frequent <i>Juncus effusus</i> at boundary).
83	316125	594181	Broad strip of <i>Juncus effusus</i> down slope (and up), marking divide to more acidic grassland (with frequent <i>Molinia</i> ).
84	315945	594193	Small burn with <i>Juncus effusus</i> to sides; local spill of wet acid grass with some wet

			heath relics ( <i>Trichophorum</i> frequent).
85	316577	594006	More enriched (less acidic) flush area extending below as broad channel with much <i>Ficaria verna</i> , <i>Ranunculus repens</i> , <i>Poa annua</i> .
86	316628	594045	Broad, shallow valley head with mosaic of wet acidic grassland (U4 to U5) but also much prominent <i>Juncus effusus</i> .
87	316758	594095	Boggy hollow ( <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Calluna vulgaris</i> ) but otherwise <i>Nardus</i> grassland.
88	316699	594129	Drier boggy vegetation with <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Pleurozium schreberi</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> and <i>Rhytidiadelphus squarrosus</i> .
89	316725	594195	Bog relic (peat 40cm) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>V. vitis-idaea</i> , <i>Erica tetralix</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>S. fallax</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> and some <i>Cladonia</i> lichen.
90	316690	594235	Wetter hollow on summit ridge with <i>Eriophorum vaginatum</i> , <i>Sphagnum palustre</i> , <i>S. fallax</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> and <i>Molinia caerulea</i> .
91	316518	594134	Relic bog in small saddle with some deep peat (50cm); <i>Eriophorum vaginatum</i> , <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Pleurozium schreberi</i> , <i>Luzula multiflora</i> , <i>Vaccinium myrtillus</i> and <i>Juncus squarrosus</i> .
92	316509	594175	Bog relics grading to acid grassland (some deep peat 30cm), with <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Sphagnum capillifolium</i> etc.
93	316420	594127	Boggy crest with <i>Sphagnum fallax</i> and increased <i>Juncus squarrosus</i> and <i>Carex nigra</i> .
94	316298	594105	Slight hollow with much <i>Juncus effusus</i> with moss (some <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> ) with <i>Carex nigra</i> and rare <i>Eriophorum vaginatum</i> .
95	316328	594196	<i>Juncus effusus</i> hollow (below small U4 ridge) with occasional <i>Sphagnum fallax</i> and rare <i>Eriophorum vaginatum</i> , in extensive wet acid grassland.
96	316282	594241	<i>Carex nigra</i> with <i>Sphagnum</i> mire to side of <i>Juncus effusus</i> stand (broader above); rare <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> .
97	316432	594218	Boggy relics with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum</i> spp., <i>Pleurozium schreberi</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> and the liverwort <i>Mylia taylorii</i> .
98	316554	594235	Low ridge with grassy wet heath cover: <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum capillifolium</i> and other mosses.
99	316562	594288	Boggy vegetation on fairly deep peat (c. 30cm): <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Rhytidiadelphus loreus</i> , <i>R. squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
100	316663	594325	Drier ridge with <i>Nardus stricta</i> dominating but nearby wetter with ericoids and <i>Eriophorum vaginatum</i> .
101	316649	594352	Small spring ( <i>Cratoneuron commutatum</i> and <i>Drepanocladus</i> sp.) to top of <i>Juncus acutiflorus</i> flush.
102	316554	594401	Relic wet heath/bog area with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus loreus</i> and <i>Polytrichum commune</i> .
103	316474	594415	Boggy wet heath area with <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> and <i>Rhytidiadelphus loreus</i> .
104	316445	594366	Extensive wet acid grassland ( <i>Nardus</i> type) with some <i>Molinia caerulea</i> plus occasional <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> , plus <i>Agrostis canina</i> , <i>Juncus</i>



			squarrosus, <i>Hylocomium splendens</i> , <i>Polytrichum commune</i> and <i>Carex nigra</i>	126	315875	594357	Wet rushy pasture with much <i>Juncus acutiflorus</i> and moss.
105	316359	594412	Acid grassland slope but with increasing bog (or wet heath) relics: <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> and <i>Sphagnum capillifolium</i> .	127	315895	594229	Wetter bog here with <i>Sphagnum papillosum</i> , <i>Vaccinium myrtillus</i> but grading to wet <i>Juncus squarrosus</i> degraded bog.
106	316280	594369	Mosaic of grassy <i>Eriophorum vaginatum</i> with <i>Molinia caerulea</i> plus some ericoids and <i>Trichophorum germanicum</i> .	128	315883	594219	Wetter area with some short heather and much <i>Sphagnum</i> , plus some <i>Vaccinium oxycoccus</i> .
107	316218	594413	<i>Molinia caerulea</i> and <i>Nardus stricta</i> common (no ericoids), with <i>Juncus effusus</i> to wall.	129	316023	594322	Diverse but drained <i>Juncus acutiflorus</i> fen below embankment; initially some <i>Sphagnum</i> but mainly herbs: <i>Filipendula ulmaria</i> , <i>Crepis paludosa</i> , <i>Valeriana dioica</i> , <i>Ficaria verna</i> , <i>Taraxacum faeroense</i> .
108	316341	594440	Leveller area with increased <i>Sphagnum</i> ( <i>S. fallax</i> ) and some <i>Empetrum nigrum</i> ; otherwise graminoid wet heath (or bog as <i>Eriophorum vaginatum</i> common).	130	316006	594347	Embankment slope with little peat and wet heath cover ( <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> etc).
109	316348	594466	Wetter area of boggy vegetation with few ericoids but frequent <i>Eriophorum vaginatum</i> plus <i>Polytrichum commune</i> , <i>Sphagnum fallax</i> and <i>Pleurozium schreberi</i> .	131	315977	594432	Wet bog transition vegetation with <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , occasional <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> .
110	316308	594501	Slope with short grazed wet heath ( <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> and some <i>Vaccinium vitis-idaea</i> ).	132	316063	594423	Wet flush with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> and <i>Carex nigra</i> .
111	315047	593730	Relic drained and short grazed bog with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Eriophorum vaginatum</i> , <i>Narthecium ossifragum</i> , <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Sphagnum papillosum</i> , <i>S. fallax</i> and <i>Aulacomnium palustre</i> .	133	316120	594413	Long embankment on slope grading to bog margins on leveller ground above: <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> include <i>S. tenellum</i> and <i>S. compactum</i> .
112	315181	593762	Heavily grazed wet grassland with cropped <i>Juncus acutiflorus</i> with <i>Carex</i> spp., <i>Molinia caerulea</i> but seemingly quite diverse with some <i>Avenula pubescens</i> , <i>Lathyrus linifolius</i> , <i>Achillea ptarmica</i> and <i>Anemone nemorosa</i> .	134	316115	594439	Wetter hollow with much <i>Sphagnum fallax</i> plus <i>Polytrichum commune</i> , <i>Carex nigra</i> and <i>Pleurozium schreberi</i> .
113	315099	593877	Short grazed acidic grassland, wetter and more acidic (but somewhat enriched) than other pasture below with <i>Nardus stricta</i> , <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Carex panicea</i> and some <i>Trichophorum germanicum</i> .	135	316044	594463	Ridge tops with a short turf and dense patches of <i>Juncus effusus</i> , not marshy but poor draining and turf with mostly <i>Carex nigra</i> and <i>Rhynchospora squarrosus</i> (occasional <i>Sphagnum</i> relic or <i>Nardus stricta</i> ).
114	315268	594081	Relic boggy vegetation (peat c. 30cm) in level area by fence with <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Sphagnum</i> spp.	136	316090	594482	Local area of wetter mire (c. 30cm peat) with <i>Sphagnum fallax</i> plus <i>Carex nigra</i> , <i>Polytrichum commune</i> and occasional <i>Eriophorum vaginatum</i> .
115	315315	594258	Relic bog extending down gentle (drained) slope from fence with locally abundant <i>Sphagnum</i> (some <i>Aulacomnium palustre</i> ), plus <i>Eriophorum vaginatum</i> , <i>Erica tetralix</i> , short <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccus</i> and <i>Drosera rotundifolia</i> .	137	316196	594580	Wetter bog with much <i>Sphagnum</i> (some <i>S. papillosum</i> ) with <i>Eriophorum</i> spp., <i>Vaccinium oxycoccus</i> , <i>Trichophorum germanicum</i> and <i>Aulacomnium palustre</i> ; spills to margins.
116	315345	594245	Bog vegetation extends up to fence with frequent <i>Sphagnum</i> but more wet heath-like.	138	316239	594593	Shallower peat (20cm) with increasingly wet heath vegetation but frequent <i>Eriophorum vaginatum</i> : <i>Sphagnum capillifolium</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Molinia caerulea</i> , <i>Rhynchospora loreus</i> , <i>Sphagnum fallax</i> and some <i>Vaccinium vitis-idaea</i> .
117	315381	594245	Below drain a more graminoid degraded bog with much less <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; much <i>Molinia</i> with <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> and <i>Vaccinium myrtillus</i> .	139	316233	594649	Poached and degraded bog or wet heath (shallow peat) but with frequent <i>Sphagnum</i> and <i>Eriophorum vaginatum</i> ; <i>Trichophorum</i> increasing with <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and short <i>Calluna vulgaris</i> .
118	315389	594331	Flushing down slope with locally much <i>Juncus effusus</i> (here with <i>Sphagnum</i> ) and some flushed acid grassland (often much <i>Molinia</i> ).	140	316154	594591	Ridge with <i>Juncus effusus</i> , mossy and poached, with some acidic relic indicators ( <i>Pleurozium schreberi</i> and <i>Sphagnum</i> spp.).
119	315536	594219	Old drain (burn) and dyke; slope above with mossy acid grass ( <i>Juncus squarrosus</i> but frequent <i>Molinia caerulea</i> ).	141	316004	594582	Better quality bog (but well drained) on peat c. 30 to 50cm; good <i>Sphagnum</i> cover (some <i>S. papillosum</i> , <i>S. cuspidatum</i> ) with <i>Vaccinium oxycoccus</i> , <i>Erica tetralix</i> , <i>Drosera rotundifolia</i> frequent; some <i>Sphagnum capillifolium</i> hummocks with <i>Polytrichum strictum</i> , <i>Vaccinium myrtillus</i> and <i>Pleurozium schreberi</i> .
120	315544	594328	Slopes with a rather complex mosaic of acid grasslands (some wet and more acidic) with bracken and <i>Juncus effusus</i> patches.	142	316049	594607	Quality bog but drained (deep peat) with <i>Vaccinium oxycoccus</i> , <i>V. vitis-idaea</i> , <i>Eriophorum angustifolium</i> , <i>Narthecium ossifragum</i> , <i>Empetrum nigrum</i> , <i>Sphagnum papillosum</i> , <i>S. cuspidatum</i> , <i>Rhynchospora loreus</i> and <i>Odontoschisma sphagni</i> .
121	315545	594349	Steep slope with local domination by <i>Juncus effusus</i> but some patches of wet short pasture (some enriched) but others with more acidic relic ( <i>Nardus stricta</i> , moss).	143	316075	594680	Bog tongue extends here (by drain), but with increasing <i>Sphagnum fallax</i> , <i>Carex nigra</i> and <i>Juncus squarrosus</i> .
122	315457	594446	Slope dominated by mix of <i>Juncus effusus</i> and bracken; above wet pasture with <i>Juncus effusus</i> (diffuse or patches).	144	315961	594738	Bog spills down here with increased <i>Juncus squarrosus</i> but still bog elements <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhynchospora loreus</i> and <i>Aulacomnium palustre</i> .
123	315567	594433	Locally more acidic wet grassland with <i>Nardus stricta</i> but also much <i>Juncus effusus</i> (diffuse or patches), but below is enriched pasture.	145	315948	594762	Poached, mossy (much <i>Calligonella cuspidata</i> ) wet pasture or rush mire about burn; more acidic to east side.
124	315728	594330	Weak ridge (by small burn) with less enriched acid grass (and bracken).				
125	315875	594464	Very wet and poached pasture with frequent <i>Juncus acutiflorus</i> .				

146	315892	594737	Very wet and poached (some stony rubble) pasture with some marshy zones (similar up to old fold).
147	315824	594719	Steepening slope with less enriched pasture (still short grazed).
148	315776	594639	Top of <i>Juncus effusus</i> flush (about drain line); pasture above less enriched.
149	315591	594655	Vague old drain line through otherwise enriched pasture down slope with local patches of bracken or <i>Juncus effusus</i> ; locally poached or flushed.
150	315530	594697	Steep slope with increased bracken but also network of <i>Juncus effusus</i> drains and flushes.
151	315425	594757	Level area supporting relic bog with much <i>Sphagnum</i> plus <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Rhytidiadelphus loreus</i> and <i>Aulacomnium palustre</i> .
152	315444	594855	Extensive slope of wet acid grassland: <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> , <i>Anthoxanthum odoratum</i> , <i>Potentilla erecta</i> , <i>Luzula campestris</i> , <i>Pleurozium schreberi</i> and occasional <i>Eriophorum vaginatum</i> .
153	315549	594821	Hill summit with mossy acidic grass turf ( <i>Carex nigra</i> and <i>Rhytidiadelphus squarrosus</i> ) plus some boggy relics ( <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Juncus squarrosus</i> and <i>Eriophorum vaginatum</i> ).
154	315620	594849	Higher quality bog relic with <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> .
155	315697	594843	Extensive upper slope with short turf but with <i>Carex nigra</i> and <i>Rhytidiadelphus squarrosus</i> in abundance with locally frequent <i>Juncus effusus</i> ; other species (scarce) include <i>Anthoxanthum odoratum</i> , <i>Luzula campestris</i> , <i>L. pilosa</i> and <i>Festuca ovina</i> , with some (rare) relics of acidic progenitors (e.g. <i>Juncus squarrosus</i> and <i>Pleurozium schreberi</i> ).
156	315711	594902	Bog becoming grassier with increased <i>Carex nigra</i> and hypnoid mosses plus <i>Polytrichum commune</i> , <i>Anthoxanthum odoratum</i> and <i>Nardus stricta</i> .
157	315601	594918	Slightly enriched ridge between bog zone with <i>Juncus effusus</i> plus <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> and some <i>Nardus stricta</i> .
158	315490	594906	Below increasing bog relics including some hummocks ( <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> ); peat not very deep.
159	315504	595002	Leveller are with wetter bog and frequent <i>Eriophorum vaginatum</i> tussocks, plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Molina caerulea</i> , <i>Carex nigra</i> , <i>Luzula multiflora</i> , <i>Sphagnum</i> (some <i>S. papillosum</i> ), <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Aulacomnium palustre</i> .
160	315624	594985	Bog with much <i>Sphagnum</i> ( <i>S. rubellum/capillifolium</i> , <i>S. fallax</i> ) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
161	315692	594987	Flushed short turf with increasing <i>Juncus acutiflorus</i> (more so below); turf enriched with <i>Ficaria verna</i> , <i>Trifolium repens</i> , <i>Ranunculus repens</i> , <i>Cardamine pratensis</i> and <i>Calliergonella cuspidata</i> .
162	315757	594966	Tussocky graminoid bog (grading to acid grassland) with frequent <i>Eriophorum vaginatum</i> plus much hypnoid mosses; frequent <i>Vaccinium myrtillus</i> , plus <i>Polytrichum commune</i> , <i>Carex nigra</i> , <i>Potentilla erecta</i> , <i>Molinia caerulea</i> and <i>Anthoxanthum odoratum</i> .
163	315773	594972	Bog vegetation (c. 30cm deep peat) with <i>Eriophorum vaginatum</i> and <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , <i>Sphagnum capillifolium</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Pleurozium schreberi</i> .
164	315699	595051	<i>Juncus effusus</i> common but with acid grass relics ( <i>Polytrichum commune</i> , <i>Nardus stricta</i> , <i>Carex nigra</i> and <i>Eriophorum vaginatum</i> ), grading to <i>Juncus acutiflorus</i> mire

			flushing near drain loop below.
165	315772	595073	Bog vegetation and drains feed small, but steep-sided burn valley with short grassland plus some bracken, dry heath and <i>Juncus acutiflorus</i> flushing: species include <i>Ficaria verna</i> , <i>Oxalis acetosella</i> , <i>Luzula pilosa</i> , <i>Oreopteris limbosperma</i> , <i>Conopodium majus</i> , <i>Viola palustris</i> , <i>V. riviniana</i> , <i>Equisetum palustre</i> , <i>Crepis paludosa</i> , <i>Filipendula ulmaria</i> and <i>Cirsium palustre</i> .
166	315878	594999	Mostly dry boggy vegetation (peat c. 30cm) on steep slope with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> , <i>Sphagnum capillifolium</i> and <i>Rhytidiadelphus</i> spp.
167	315894	595010	Steep lower slopes with intermediate degraded bog relics and acid grassland elements (and some <i>Juncus effusus</i> patches below).
168	315992	594994	Wet track with deep ruts through a large but very wet and badly poached rush area (some very deep and with <i>Glyceria</i> ).
169	315964	595026	Short grazed pasture extends from south but here more flushed (but enriched) with short <i>Juncus acutiflorus</i> , <i>Ficaria verna</i> , <i>Ranunculus</i> spp. and <i>Carex</i> spp.
170	316029	595067	Flushed short grazed (and poached) pasture on slope below hill down to burn; <i>Juncus</i> spp., <i>Carex</i> spp., bracken and some <i>Anemone nemorosa</i> .
171	316063	594882	Leveller ground with good quality wet bog: <i>Sphagnum</i> extensive (some <i>S. papillosum</i> , <i>S. tenellum</i> , <i>S. denticulatum</i> ) plus <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Drosera rotundifolia</i> <i>Empetrum nigrum</i> , <i>Odontoschisma sphagni</i> and rare <i>Cladonia</i> lichens. Very small <i>Eriophorum angustifolium</i> - <i>Sphagnum cuspidatum</i> bog pool here.
172	316148	594820	Very long old drain on slope contour separating below a more degraded bog (wet heath like) with occasional <i>Eriophorum vaginatum</i> plus frequent <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Sphagnum</i> spp.; locally <i>Carex nigra</i> and <i>Sphagnum fallax</i> flush zones.
173	316153	594888	Embankment with several old cross drains with bog grading to wet acid grassland: <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Nardus stricta</i> and <i>Polytrichum commune</i> .
174	316194	594938	Diverse mire below embankment (some bracken) extending to burn: <i>Filipendula ulmaria</i> , <i>Succisa pratensis</i> , <i>Ajuga reptans</i> , <i>Valeriana dioica</i> , <i>Geum rivale</i> , <i>Angelica sylvestris</i> , <i>Crepis paludosa</i> . Burn (new planting) with short acid grass plus relic heath, plus local primrose patches.
175	316125	594984	Gentle slope to bog margin (peat c. 30+cm) with increasing quality above with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Sphagnum</i> spp.; above some <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> and <i>Eriophorum angustifolium</i> and some hummock û hollow patterning (former with <i>Polytrichum strictum</i> ).
176	316141	595057	Wet acid grassland in transition band below bog and above burn embankment; <i>Juncus acutiflorus</i> and <i>J. effusus</i> frequent but also <i>Juncus squarrosus</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> relic.
177	316161	595075	Burn sides and area beyond with badly poached (and vehicle ruts), mostly bare ground.
178	315753	595151	Lower slopes with wet mossy grass but generally much <i>Juncus acutiflorus</i> (some short grazed though).
179	315884	595222	Broad main valley with locally diverse <i>Juncus acutiflorus</i> marsh; western side flushed and east side steeper with acid grass and some bracken.



180	315974	595266	Lower slopes with less bog relics, with abundant moss and short grazed <i>Juncus acutiflorus</i> (and more prominent <i>Juncus effusus</i> ); some <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Carex</i> spp., and mosses <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Pleurozium schreberi</i> .
181	316040	595230	Wet intermediate (and mixed) area of bog relics but grassier and tussocky ( <i>Rhytidiadelphus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and grasses) and with increasing <i>Juncus</i> spp.
182	316023	595272	Tussocky bog with <i>Eriophorum</i> spp., <i>Calluna vulgaris</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Sphagnum</i> (some <i>S. papillosum</i> ) and <i>Vaccinium oxycoccos</i> .
183	315949	595294	Drained bog relics on peat c. 30+ cm, with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Vaccinium oxycoccos</i> , <i>Sphagnum</i> spp., <i>Polytrichum commune</i> and hypnoid mosses, including <i>Rhytidiadelphus loreus</i> .
184	315850	595365	Relic area of boggy vegetation ( <i>Sphagnum</i> , <i>Erica tetralix</i> , <i>Vaccinium oxycoccos</i> ) but mostly wet rush mire here below the old (dilapidated) fence.
185	315828	595373	Broad valley with steep short grassland to sides (some bracken blocks) with <i>Oreopteris limbosperma</i> , <i>Primula vulgaris</i> and <i>Ficaria verna</i> ; flushed ( <i>Juncus acutiflorus</i> ) to sides of meandering water course.
186	315733	595334	<i>Juncus effusus</i> in and below drain, initially with <i>Sphagnum</i> but soon more mineral flushed (and with <i>Juncus acutiflorus</i> ).
187	315615	595287	Areas of <i>Nardus</i> grassland but also much <i>Juncus effusus</i> (by drains and extensive below).
188	315665	595326	Sparse relic <i>Eriophorum vaginatum</i> with moss (much <i>Polytrichum commune</i> ) plus some <i>Molinia</i> and <i>Calluna</i> ; peat c. 40cm.
189	315642	595374	Graminoid bog continues on slope below large drain ( <i>Juncus effusus</i> ); short heather with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> and hypnoid mosses.
190	315597	595426	Strips of wet short acid grassland (occasional bracken) with local patches of <i>Juncus effusus</i> .
191	315634	595472	Steep slope with relic, tussocky <i>Eriophorum vaginatum</i> bog with abundant <i>Polytrichum commune</i> plus <i>Rhytidiadelphus</i> spp., <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> and <i>Calluna vulgaris</i> .
192	315587	595477	Steep slope with tussocky, degraded and mossy relic bog (peat c. 30cm), with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> and <i>Sphagnum</i> .
193	315609	595524	Deep drain/burn ( <i>Juncus</i> and flushing) with <i>Nardus</i> grassland (some bracken) but also areas of wet heath relics (grazed) with <i>Calluna vulgaris</i> , <i>Molinia</i> , <i>Trichophorum</i> and <i>Vaccinium myrtillus</i> .
194	315912	595429	<i>Juncus effusus</i> over moss dominated vegetation, with some <i>Digitalis purpurea</i> and <i>Cardamine flexuosa</i> ; occasional <i>Nardus stricta</i> , <i>Molinia caerulea</i> and <i>Carex nigra</i> .
195	315866	595466	Extensive wet, very mossy acid grassland mostly dominated by <i>Juncus effusus</i> ; some tussocky <i>Polytrichum commune</i> with <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Sphagnum fallax</i> and occasional short <i>Eriophorum vaginatum</i> , but rare ericoids.
196	315848	595480	Boggy vegetation below (peat c. 40cm) with <i>Trichophorum</i> , <i>Molinia</i> , <i>Calluna</i> , <i>Polygala serpyllifolia</i> , <i>Potentilla erecta</i> , <i>Erica tetralix</i> , <i>Sphagnum</i> , <i>Polytrichum commune</i> and <i>Hylocomium splendens</i> .
197	315831	595503	<i>Juncus effusus</i> tending to dominate with much moss, <i>Cirsium palustre</i> , local <i>J. acutiflorus</i> and <i>Molinia caerulea</i> , but also frequent <i>Digitalis purpurea</i> and <i>Cardamine</i>

			<i>flexuosa</i> (disturbance?). Above (near peaty relics) <i>Juncus effusus</i> with some <i>Sphagnum</i> .
198	315808	595497	Slight ridge with mosaic of <i>Juncus effusus</i> and wet acidic grassland elements ( <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> , <i>Nardus stricta</i> and some <i>Molinia caerulea</i> ).
199	315901	595582	<i>Juncus effusus</i> dominating but not marshy and with much <i>Rhytidiadelphus squarrosus</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> .
200	315842	595587	Extensive wet acid grassland with much <i>Juncus effusus</i> : <i>Carex nigra</i> , and <i>Rhytidiadelphus squarrosus</i> , plus <i>Anthoxanthum odoratum</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> and some <i>Molinia caerulea</i> .
201	315752	595603	Tussocky wet moss ( <i>Polytrichum commune</i> , hypnoid mosses, occasional <i>Sphagnum</i> ) with frequent <i>Juncus effusus</i>
202	315651	595658	Steep valley side with some patches of dry heath and bracken, otherwise short grassland (some flushed) and below occasional <i>Juncus effusus</i> stand.
203	315685	595689	Contrast to south of fence with short grazed tussocky <i>Polytrichum commune</i> with hypnoid mosses and some <i>Sphagnum</i> (below), but some short ericoids, and local <i>Vaccinium oxycoccos</i> .
204	315823	595682	<i>Nardus</i> grassland but with some wet heath elements ( <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Molinia</i> <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> ); <i>Juncus effusus</i> frequent too dense nearby.
205	315991	595699	Small ellipse of relic wet bog (mire like) with much <i>Sphagnum</i> ( <i>S. fallax</i> and <i>S. capillifolium</i> ) plus <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Carex nigra</i> , <i>Juncus squarrosus</i> and <i>Eriophorum</i> spp.
206	316203	595322	Very deep drain with steep bank below ( <i>Nardus stricta</i> ); below broad short grassland with occasional <i>Juncus effusus</i> patches.
207	316120	595608	Wetter area of <i>Juncus effusus</i> with <i>Carex nigra</i> plus some <i>Sphagnum</i> and occasional <i>Eriophorum vaginatum</i> .
208	316170	595652	Slope with <i>Juncus effusus</i> prominent but also much <i>Carex nigra</i> and moss; some relic <i>Nardus stricta</i> and <i>Molinia caerulea</i> .
209	316214	595739	U-shaped valley with acid grassland to base plus occasional <i>Juncus</i> flushes or patches; west side crenellated with local bracken plus occasional <i>Oreopteris limbosperma</i> , <i>Digitalis purpurea</i> or rare hawthorn; other herbs include <i>Primula vulgaris</i> , <i>Oxalis acetosella</i> , <i>Viola palustris</i> and <i>Luzula pilosa</i> .
210	316156	595748	Broad ledge between slope and valley with much <i>Juncus</i> (to slope bottom) but also relic graminoid bog, drained and tussocky, with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> plus <i>Molinia</i> , <i>Juncus squarrosus</i> and occasional <i>Trichophorum</i> and <i>Erica tetralix</i> .
211	315951	595843	Fence provides sharp contrast between bog to north and wet acid grassland (with rush) to south; here some bog elements spill over with <i>Eriophorum vaginatum</i> , <i>Carex nigra</i> and <i>Polytrichum commune</i> .
212	316000	595848	Slope with increasing <i>Juncus effusus</i> plus <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> and rare to occasional <i>Eriophorum vaginatum</i> .
213	316111	595886	Relic area of tussock graminoid bog ( <i>Eriophorum vaginatum</i> , <i>Sphagnum</i> , <i>Polytrichum commune</i> ) but grading to <i>Juncus</i> above drains and flushes.
214	314545	595556	Side of hill with old drain ( <i>Juncus effusus</i> ) and slight erosion slip; below acid grass locally with more bracken.
215	314495	595659	Steep sided burn with some erosion areas (often with <i>Epilobium brunnescens</i> ); wet acid grassland with bracken and flushes, with <i>Chrysosplenium oppositifolium</i> , <i>Stellaria alsine</i> , <i>Ranunculus</i> spp., <i>Myosotis secunda</i> , <i>Cardamine amara</i> , <i>Lysimachia nemorum</i> and <i>Veronica beccabunga</i> .



216	314566	595721	Slope here with increased <i>Molinia caerulea</i> (but still <i>Juncus acutiflorus</i> ), tussocky with wet acid grassland.
217	314573	595900	Small spring with <i>Philonotis</i> sp., <i>Palustriella falcata</i> and local <i>Briza media</i> ; <i>Juncus acutiflorus</i> and <i>Molinia caerulea</i> dominated flushed slopes.
218	314523	596020	Short-grazed, flushed but enriched grassland feeding small burn; short <i>Cynosurus cristatus</i> , <i>Trifolium repens</i> , <i>Ranunculus acris</i> , <i>Cardamine pratensis</i> , <i>Carex</i> spp., and <i>Caliergonella cuspidata</i> .
219	314747	596176	Steep sided drain or burn (scoured) with frequent <i>Juncus effusus</i> (some broader patches) but also acid grassland and bracken; <i>Juncus effusus</i> broader to top of valley above.
220	314745	595781	<i>Molinia</i> extensive with <i>Nardus stricta</i> , <i>Potentilla erecta</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Pleurozium schreberi</i> and occasional <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> plus (some small <i>Juncus effusus</i> and short pasture patches).
221	314813	595783	Slope below fence with tussocky <i>Eriophorum vaginatum</i> grading to tussocky <i>Molinia caerulea</i> (but with some <i>Trichophorum germanicum</i> and <i>Vaccinium myrtillus</i> indicating wet heath link).
222	314781	595719	<i>Molinia caerulea</i> common (tussocky) with a grassier appearance (few heath links).
223	314758	595677	<i>Molinia caerulea</i> common but grassy and with some wet heath elements.
224	314782	595481	Drains through bog relic; bog with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium oxycoccos</i> , <i>Drosera rotundifolia</i> plus <i>Sphagnum</i> spp (some <i>S. papillosum</i> ), <i>Polytrichum commune</i> and <i>Rhytidiadelphus loreus</i> .
225	314818	595522	Up the slope (from bog below) vegetation with a graminoid wet heath appearance with <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> and various mosses.
226	314857	595579	Further up slope Ns increases but also occasional relic <i>Eriophorum vaginatum</i> . Short bryophytes seem diverse with <i>Dicranum scoparium</i> , <i>Campylopus flexuosus</i> , <i>Ptilidium ciliare</i> , <i>Barbilophozia attenuata</i> etc.
227	314883	595617	Relic area of <i>Eriophorum vaginatum</i> with <i>Polytrichum commune</i> and <i>Sphagnum</i> , plus <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , in slight depression.
228	314927	595520	<i>Juncus acutiflorus</i> flush, very mossy (little <i>Sphagnum</i> ) with some <i>Cardamine pratensis</i> and <i>Cirsium palustre</i> . Frequent old drain lines some with <i>Juncus effusus</i> and <i>Sphagnum</i> , but others flushed <i>Juncus acutiflorus</i> .
229	315053	595523	Wet grassland with graminoid <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> bog relics, with several deep drains.
230	315110	595534	Relic graminoid bog (peat > 50cm) with <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Agrostis canina</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> spp and hypnoid mosses.
231	315186	595578	Marshy grassland with drains and some cells of relic bog ( <i>Eriophorum vaginatum</i> , <i>Molinia caerulea</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> spp).
232	315028	595598	Old contouring drain with strip of relic bog like mire ( <i>Sphagnum fallax</i> but with <i>Eriophorum vaginatum</i> ); below wet grassland with frequent <i>Molinia caerulea</i> and <i>Carex nigra</i> but also some heath elements ( <i>Vaccinium myrtillus</i> ).
233	315047	595708	Lower slopes with poorly draining wet acidic grassland and some relics of former bog; <i>Molinia caerulea</i> is common but with various wet heath elements ( <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> ) and frequent <i>Carex nigra</i> .
234	315186	595727	Steep slope with some relic <i>Eriophorum vaginatum</i> but also wet heath elements ( <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> ) in various amounts; mosses include <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and <i>Polytrichum commune</i> .

235	315123	595866	Intermediate relic bog or graminoid wet heath on slope (peat c. 20cm deep); <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , mosses ( <i>Sphagnum fallax</i> , <i>S. capillifolium</i> , <i>Pleurozium</i> , <i>Rhytidiadelphus loreus</i> ) and occasional <i>Juncus squarrosus</i> and <i>Trichophorum germanicum</i> .
236	315086	595999	Very steep slope with graminoid relics of wet heath or bog vegetation ( <i>Molinia</i> , <i>Polytrichum commune</i> , <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> and <i>Sphagnum capillifolium</i> ).
237	314879	595965	Bog spill but only limited <i>Eriophorum vaginatum</i> (plus <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> ).
238	314994	596026	<i>Eriophorum vaginatum</i> frequent (peat c. 25cm) but with wet acid grassland and some wet heath elements ( <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and mosses).
239	314946	596057	Wet acid grassland with some wet heath or bog relics but hard to demarcate: <i>Nardus stricta</i> with <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> plus some <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> .
240	315058	596132	Drained cells of relic (but modified) graminoid bog (peat 40+ cm): tussocky <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> lawns (plus <i>Juncus squarrosus</i> and <i>Carex nigra</i> ).
241	314976	596149	Steep slope above <i>Juncus</i> lined flush with acid grass grading to bog relic ( <i>Eriophorum vaginatum</i> with <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> ).
242	314937	596237	Wet bog with much <i>Sphagnum</i> ( <i>S. fallax</i> , <i>S. capillifolium</i> , and rare <i>S. papillosum</i> ) at fence corner; with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Rhytidiadelphus loreus</i> and <i>Polytrichum commune</i> .
243	314999	596276	Gentle slope with drying bog (peat c. 25cm) with sparse <i>Eriophorum vaginatum</i> plus wet heath indicators (more so to south) <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and various mosses.
244	315080	596251	East side of burn with drained ( <i>Juncus effusus</i> lines) cells of modified bog <i>Juncus squarrosus</i> frequent (some short <i>Eriophorum vaginatum</i> ), <i>Carex nigra</i> , with <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> , and some <i>Vaccinium oxycoccos</i> .
245	315216	596392	Narrow flush below <i>Juncus effusus</i> patch with <i>Carex nigra</i> or <i>Juncus squarrosus</i> in otherwise extensive <i>Nardus stricta</i> grassland: associates include <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula pilosa</i> , <i>Carex binervis</i> , rare <i>Trichophorum germanicum</i> or <i>Molinia caerulea</i> and various mosses.
246	315254	596384	Curious ridges and hollows patterning with former supporting <i>Nardus stricta</i> and wetter <i>Juncus squarrosus</i> acid grassland.
247	315283	596288	Wetter flush line with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Carex nigra</i> and <i>Juncus effusus</i> ; margins with increased <i>Juncus squarrosus</i> but soon Ns type grassland.
248	315361	596376	Saddle area to top of shallow valley with relic boggy vegetation but dominated by <i>Juncus squarrosus</i> with <i>Sphagnum</i> but seemingly little or no <i>Eriophorum vaginatum</i> .
249	315573	596498	Wetter flushing marked by increasing <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> ; locally boggy (peat 30cm) with some <i>Sphagnum papillosum</i> and rare <i>Eriophorum vaginatum</i> .
250	315673	596585	Very large area of wet <i>Sphagnum fallax</i> dominated mire with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> ; grading relic bog at margins but soon wet acid grassland up slope.

251	315623	596236	Extensive short-grazed wet grassland (drained) with much <i>Rhytidiadelphus squarrosus</i> and <i>Juncus acutiflorus</i> ; occasional <i>Polytrichum commune</i> and <i>Juncus squarrosus</i> .	271	315588	595660	Leveller area with wetter, deeper peat, <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> and <i>Calluna vulgaris</i> .
252	315557	596229	Steep slope (peat c. 30cm) dominated by short moss: much <i>Polytrichum commune</i> with <i>Sphagnum</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus</i> spp., plus <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , short <i>Calluna</i> and some <i>Molinia caerulea</i> and <i>Trichophorum germanicum</i> .	272	315591	595689	Feeder valley with <i>Juncus acutiflorus</i> flushing with some freer draining acid grass ( <i>Nardus</i> ); <i>Ajuga reptans</i> frequent with <i>Cirsium palustre</i> , <i>Luzula pilosa</i> and some ferns.
253	315676	596188	Strip of wet heath to west side fence above small burn; west side with <i>Nardus</i> grassland.	273	315671	595721	Slope with graminoid tussocky <i>Eriophorum vaginatum</i> plus <i>Sphagnum</i> spp., <i>Polytrichum commune</i> and some <i>Calluna vulgaris</i> , <i>Erica tetralix</i> and <i>Trichophorum germanicum</i> (hummocks with <i>Vaccinium myrtillus</i> , <i>Sphagnum capillifolium</i> and <i>Polytrichum strictum</i> ).
254	315507	596108	Extensive slope with short grazed, but tussocky, bog vegetation (peat c. 20cm); some <i>Eriophorum vaginatum</i> with much <i>Polytrichum commune</i> plus <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> (short), and mosses include <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> , <i>Hylocomium splendens</i> and <i>Sphagnum</i> .	274	315690	595830	Extensive wet heath (peat c. 30cm) with <i>Calluna vulgaris</i> frequent but also much <i>Juncus squarrosus</i> plus <i>Polytrichum commune</i> and <i>Sphagnum</i> .
255	315364	596129	<i>Juncus squarrosus</i> acid grassland with some bog elements, usually linked to spills or flushing from boggy relics.	275	315697	595921	Slope here with increasing ericoids plus <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Sphagnum</i>
256	315366	596067	Leveller area with very wet boggy more (often much <i>Sphagnum fallax</i> ) with <i>S. capillifolium</i> , <i>Juncus squarrosus</i> , <i>Aulacomnium palustre</i> , <i>Polytrichum strictum</i> and some <i>Eriophorum vaginatum</i> .	276	315645	595954	Burn here with broad <i>Juncus acutiflorus</i> flush (with <i>Ajuga</i> , <i>Ficaria verna</i> , <i>Ranunculus repens</i> ) and steeper sides free draining with acid grass ( <i>Nardus</i> ) plus occasional fern.
257	315288	596135	Wetter flush with <i>Sphagnum fallax</i> , <i>Polytrichum commune</i> , <i>Carex nigra</i> and some <i>Juncus effusus</i> patches.	277	315693	595959	<i>Juncus effusus</i> (and <i>Sphagnum</i> ) drain marks boundary of steep slope with bog below; latter on slope with increasing <i>Molinia</i> and <i>Eriophorum</i> .
258	315245	596066	Local cells of <i>Juncus squarrosus</i> wet acid grassland (relic bog).	278	315731	596011	Extensive slope of <i>Nardus stricta</i> grassland locally wet with <i>Carex nigra</i> , <i>Molinia caerulea</i> , <i>Deschampsia flexuosa</i> , <i>Anthoxanthum odoratum</i> , <i>Vaccinium myrtillus</i> , <i>Luzula</i> spp., <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Polytrichum commune</i> .
259	315187	596043	Near burn short-grazed, very wet mossy grassland (much <i>Rhytidiadelphus squarrosus</i> ), in cells form by <i>Juncus effusus</i> drain.	279	315686	596078	Bog wetter here: <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Sphagnum</i> (but <i>S. papillosum</i> absent), <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> and <i>Polytrichum commune</i> .
260	315225	595925	Central burn with <i>Juncus</i> spp.-dominated flushing; sides with acid grassland but also flushed from above; <i>Nardus</i> locally frequent on slopes.	280	315703	596144	Bog becoming drier with much <i>Eriophorum vaginatum</i> but still plenty of <i>Sphagnum</i> plus <i>Calluna vulgaris</i> , <i>Erica tetralix</i> and <i>Molinia caerulea</i> .
261	315278	595919	Gentle slope to east of burn with similar wet, drained acid grassland, but more acidic locally (some deep peat – with <i>Molinia</i> , <i>Juncus squarrosus</i> ).	281	315839	596171	Ground leveller supporting wetter bog with abundant <i>Sphagnum</i> cover (some <i>S. papillosum</i> and <i>S. cuspidatum</i> ) plus <i>Polytrichum strictum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> and some <i>Erica tetralix</i> and <i>Vaccinium oxycoccos</i> .
262	315207	595863	Broad open valley with extensive cover of short grazed, very wet, moss dominated grassland with much rush ( <i>Juncus effusus</i> prominent, but <i>J. acutiflorus</i> short grazed)	282	315854	596072	Graminoid tussocky bog (peat c. 30 cm) <i>Eriophorum vaginatum</i> with <i>Pleurozium schreberi</i> and <i>Vaccinium myrtillus</i> to hummocks with between <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Carex nigra</i> , <i>Calluna vulgaris</i> and some <i>Molinia caerulea</i> .
263	315301	595835	Vegetation boggier with <i>Juncus squarrosus</i> plus <i>Trichophorum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> etc.	283	315853	595984	Summit ridge of scattered <i>Juncus effusus</i> in wet acid grassland: <i>Rhytidiadelphus squarrosus</i> common with <i>Carex nigra</i> plus <i>Anthoxanthum odoratum</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Galium saxatile</i> and occasional relic <i>Eriophorum vaginatum</i> .
264	315463	595892	Mosaic of wet <i>Nardus</i> grassland and <i>Juncus effusus</i> 'marsh'; latter often associated with old drains and some diffuse flushing.	284	315860	595898	Wet bog on leveller ground (peat 40+ cm) ( <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> and <i>S. capillifolium</i> plus <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> , <i>Rhytidiadelphus loreus</i> and <i>Aulacomnium palustre</i> ).
265	315243	595693	Slump of more acidic wet acid grassland (with <i>Juncus squarrosus</i> , <i>Nardus stricta</i> and <i>Molinia</i> , plus <i>Sphagnum</i> and occasional short heather).	285	315969	595900	Slope with drying bog (increased <i>Eriophorum vaginatum</i> but less <i>Sphagnum</i> ) plus <i>Carex nigra</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and occasional <i>Calluna vulgaris</i> or <i>Molinia caerulea</i> .
266	315239	595656	Short grazed flushes below fence with local high diversity: <i>Carex</i> spp., various short herbs (some <i>Ajuga reptans</i> ) and abundant mosses include some <i>Ctenidium molluscum</i> and <i>Climacium dendroides</i> .	286	316016	596006	Series of big old cross drains; below bog is more wet heath like with increased <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> and <i>Calluna vulgaris</i> .
267	315289	595571	Mosaic of wet ,short grazed, often moss dominated, marshy grassland but with some relic areas with bog (or wet heath) relics.	287	315934	596117	Wetter bog (some <i>Sphagnum papillosum</i> ) but with <i>Eriophorum vaginatum</i> domination (but some <i>Calluna vulgaris</i> and <i>Erica tetralix</i> ).
268	315428	595715	Some ericoids but very graminoid and mossy (peat c. 40cm); some <i>Vaccinium oxycoccos</i> .	288	316104	595997	Feeder valley with some <i>Nardus</i> to side, and <i>Juncus</i> flushing, with some wet <i>Eriophorum vaginatum</i> (with <i>Sphagnum</i> and <i>Polytrichum commune</i> ).
269	315506	595744	Deeper peat (c. 50cm), but drained and very mossy, with relic bog elements: <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Vaccinium myrtillus</i> , <i>Erica tetralix</i> , <i>Potentilla erecta</i> , <i>Polytrichum commune</i> , <i>Sphagnum</i> , <i>Rhytidiadelphus loreus</i> and some <i>Polytrichum strictum</i> hummocks.	289	316091	596050	Graminoid bog relic on gentle slope (drained) with increased <i>Polytrichum commune</i>
270	315543	595712	Sloping towards burn with drained, short-grazed, wet moss dominated 'marshy grassland' with abundant <i>Juncus acutiflorus</i> , plus <i>Molinia</i> , <i>Carex</i> spp., <i>Nardus stricta</i> , <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> .				



			and <i>Molinia caerulea</i> .
290	316082	596104	Deep <i>Juncus effusus</i> drain (with <i>Sphagnum</i> ) through wet graminoid bog.
291	316050	596111	Broad <i>Juncus effusus</i> strip, and drain, (some with <i>Sphagnum</i> ) below steep slope.
292	316026	596114	Steep slope here with increased <i>Molinia</i> and some <i>Juncus squarrosus</i> ; to north <i>Eriophorum vaginatum</i> increases with usual associates: <i>Molinia</i> , <i>Vaccinium myrtillus</i> , occasional <i>Calluna vulgaris</i> or <i>Erica tetralix</i> , rare <i>Vaccinium vitis-idaea</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Sphagnum fallax</i> .
293	316022	596116	Lower slope with a more wet heath like vegetation (frequent <i>Molinia caerulea</i> ) but with ericoids and often bog element where seepage from bog above.
294	316101	596161	Locally increased <i>Molinia</i> (on deep peat) with some <i>Trichophorum germanicum</i> (and <i>Eriophorum</i> bog elements), and to drains <i>Juncus effusus</i> .
295	316023	596169	Local <i>Nardus stricta</i> or <i>Juncus squarrosus</i> on steep sections but also much flushing (with <i>Carex nigra</i> , <i>C. echinata</i> , <i>Agrostis canina</i> ) merging with <i>Juncus effusus</i> zones to old drains.
296	316115	596225	Heather (with <i>Molinia</i> ) prominent over fence above burn; actual burnside with new broad-leaved planting.
297	316020	596223	Mixed area with common or scarce <i>Eriophorum</i> plus local <i>Molinia</i> and <i>Juncus squarrosus</i> , plus <i>Nardus stricta</i> , <i>Potentilla erecta</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis canina</i> , <i>Carex nigra</i> and <i>Calluna vulgaris</i> .
298	315917	596238	Below bog becoming drier with much <i>Eriophorum vaginatum</i> but frequent <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> (recovering?) plus <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> and <i>Juncus squarrosus</i> .
299	315975	596267	Grassy wet heath up slope, frequent <i>Nardus stricta</i> with prominent <i>Molinia</i> , but also <i>Calluna vulgaris</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum</i> , <i>Erica tetralix</i> , <i>Polytrichum commune</i> and <i>Sphagnum rubellum</i> .
300	315910	596286	Wet boggy vegetation (peat c. 40cm) with <i>Eriophorum vaginatum</i> , <i>Molinia</i> , <i>Trichophorum</i> , <i>Eriophorum angustifolium</i> , <i>Potentilla erecta</i> , <i>Sphagnum fallax</i> , <i>S. rubellum</i> and <i>Polytrichum commune</i> .
301	315817	596332	Level ground with good <i>Sphagnum</i> cover (some <i>S. papillosum</i> ).
302	315969	596377	Mostly graminoid wet heath on slope with frequent <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> but also <i>Carex nigra</i> , <i>Juncus squarrosus</i> and <i>Nardus stricta</i> (grading to wet acid grassland).
303	316037	596315	Wet bog <i>Eriophorum vaginatum</i> dominated but with thick <i>Sphagnum</i> carpet plus, <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> .
304	316056	596555	High ridge with acid grass and <i>Juncus effusus</i> about drains, and several peat edges (bog more disturbed and degraded).
305	316029	596440	<i>Juncus effusus</i> mire with some mineral elements ( <i>Rumex acetosa</i> , <i>Galium saxatile</i> , <i>Ranunculus repens</i> , <i>Rhytidadelphus squarrosus</i> , <i>Pseudoscleropodium purum</i> ).
306	316137	596507	Peat edges with below broad crescent of <i>Juncus acutiflorus</i> with <i>Sphagnum</i> marsh.
307	316134	596546	Drain with locally much <i>Juncus acutiflorus</i> with <i>Sphagnum</i> but also tussocky bog relics.
308	316185	596614	Local drains and acid grass nearer burn, but above graminoid bog with <i>Eriophorum vaginatum</i> plus <i>Molinia</i> , <i>Agrostis canina</i> , <i>Carex nigra</i> , occasional heather, much <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> plus <i>Pleurozium schreberi</i> .
309	316097	596339	Leveller ground with wetter bog with much <i>Sphagnum</i> (no <i>S. papillosum</i> noted) and <i>Eriophorum vaginatum</i> plus <i>Erica tetralix</i> , <i>Calluna vulgaris</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Vaccinium oxycoccos</i> and some <i>Polytrichum strictum</i> hummocks.
310	315871	596515	Wet acid grassland with much <i>Carex nigra</i> and <i>Molinia caerulea</i> .

311	315748	596471	Wet bog with much <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> (occasional <i>S. papillosum</i> ) plus <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Vaccinium myrtillus</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> .
312	315784	596597	Slopes below ridge with mineral flushed <i>Juncus acutiflorus</i> with <i>Filipendula ulmaria</i> , <i>Lathyrus pratensis</i> , <i>Ranunculus acris</i> , <i>Rumex acetosa</i> , <i>Lysimachia nemorum</i> and mosses.
313	316079	596661	Graminoid bog invaded by <i>Juncus acutiflorus</i> with much <i>Polytrichum commune</i> , <i>Rumex acetosa</i> , <i>Rhytidadelphus squarrosus</i> but some <i>Sphagnum palustre</i> .
314	316050	596727	Wet and diverse bog on level ground with some <i>Sphagnum papillosum</i> and <i>S. cuspidatum</i> , <i>Vaccinium oxycoccos</i> and <i>Aulacomnium palustre</i> .
315	315957	596774	Rising ground with peat edges and more degraded <i>Eriophorum vaginatum</i> bog; local ridge with acid grass.
316	315895	596821	Rising ground with increasing <i>Nardus stricta</i> and <i>Juncus squarrosus</i> , plus occasional <i>Calluna vulgaris</i> or <i>Trichophorum germanicum</i> ; valley below with some <i>Juncus mire</i> or acid grassland (and new broad-leaved planting).
317	315924	596787	Short grazed intermediate vegetation, very mossy, with some <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> spp., <i>Polytrichum commune</i> , <i>Rhytidadelphus loreus</i> , but also <i>Nardus stricta</i> and <i>Juncus squarrosus</i> and local heather (wet heath affinities).
318	315852	596859	Slope down to boggy mire below with intermediate relic bog ( <i>Eriophorum vaginatum</i> ), diffuse or in patches, with wet acid grassland and some wet heath elements ( <i>Trichophorum germanicum</i> , <i>Calluna vulgaris</i> ).
319	315719	596762	Boggy relic but with much <i>Juncus squarrosus</i> plus <i>Polytrichum commune</i> , <i>Vaccinium myrtillus</i> , <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Rhytidadelphus loreus</i> and <i>Sphagnum</i> spp.
320	315594	596702	Tussocky wet (and peaty c. 20cm) acid grassland with bog elements but seemingly little or no <i>Eriophorum vaginatum</i> ; <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Polytrichum commune</i> , <i>Pleurozium schreberi</i> and <i>Sphagnum</i> spp.
321	315625	596797	Mixed area of relic bog elements (but seemingly little <i>Eriophorum vaginatum</i> though tussocky) with wet acid grassland species; difficult to classify.
322	315529	596908	Spill of bog vegetation (peat c. 25cm) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> and <i>Polytrichum commune</i> .
323	315501	596964	Bog spill down slope with increasing acid grassland or flushed mire elements, more so to south side where <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , occasional <i>Eriophorum vaginatum</i> and <i>Trichophorum germanicum</i> , plus increasing <i>Rhytidadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> and <i>Nardus stricta</i> .
324	315343	596976	Short grazed bog (peat 35cm) with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> and <i>Rhytidadelphus loreus</i> .
325	315387	596759	Graminoid bog relic (up to 30cm deep peat), short grazed, with <i>Juncus squarrosus</i> but some <i>Eriophorum vaginatum</i> , plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , short <i>Calluna vulgaris</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum</i> spp., <i>Rhytidadelphus loreus</i> and other bryophytes include <i>Ptilidium ciliare</i> , <i>Campylopus</i> sp., <i>Dicranum scoparium</i> and <i>Barbilophozia</i> sp.
326	315075	596461	Low-lying valley mire but recently, and deeply, drained but retaining a good, if short (grazed) <i>Sphagnum</i> carpet: <i>S. fallax</i> , <i>S. capillifolium</i> , <i>S. papillosum</i> and <i>S. cuspidatum</i> with <i>Eriophorum vaginatum</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Vaccinium myrtillus</i> , <i>V. oxycoccos</i> , <i>Drosera rotundifolia</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum commune</i> .

326	315252	596754	Extensive cover of <i>Juncus effusus</i> but with mostly acid grassland associates ( <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> ); occasional glades of <i>Nardus</i> grassland.
327	315272	596573	Mosaic of <i>Juncus effusus</i> and <i>Nardus stricta</i> dominated zones (and much intermediate), plus occasional wetter zone with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> and <i>Polytrichum commune</i> .
328	315164	596479	Lower slope with wet <i>Juncus squarrosus</i> grassland, with some <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Sphagnum capillifolium</i> and <i>Polytrichum commune</i> but further up <i>Nardus stricta</i> increasing as drainage improves (but some wetter areas above flushed from bog spills above).
330	315096	596523	Deep (3m) canalised drain through valley mire with peaty spoil supporting <i>Juncus effusus</i> to west margins.
331	315102	596642	East side of valley mire with good cover of <i>Sphagnum</i> spp., plus short grazed <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Vaccinium oxycoccus</i> etc.
332	315046	596699	Bog continues to west side but becoming drier or enriched with increased <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> .
333	314967	596849	Bog spill with wet <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , <i>Narthecium ossifragum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum</i> spp.; grading to wet <i>Juncus</i> mire below.
334	314960	596563	East facing slope with extensive cover of graminoid wet heath (and degraded bog) with <i>Juncus squarrosus</i> with <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> , plus <i>Vaccinium myrtillus</i> , <i>Hylocomium splendens</i> and occasional <i>Sphagnum capillifolium</i> .
335	314792	596798	Steep slope with acid grassland but much <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Festuca ovina</i> , <i>Nardus stricta</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> , some <i>Vaccinium myrtillus</i> , and mosses include <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberii</i> and <i>Polytrichum commune</i> .
336	314510	596672	Shallow valley poorly draining with wet marshy grassland, grading to <i>Juncus effusus</i> mire (with <i>Sphagnum</i> ) to north and south; slope to west with relic acid grassland ( <i>Molinia</i> , <i>Juncus squarrosus</i> , <i>Nardus</i> ) but also some enrichment indicators ( <i>Trifolium repens</i> , <i>Plantago lanceolata</i> ).
337	314512	596772	Low-lying area of <i>Juncus acutiflorus</i> mire with some <i>Sphagnum</i> ( <i>S. denticulatum</i> , and <i>S. palustre</i> ) and other mosses (some <i>Calliargon cordifolium</i> ), plus <i>Galium palustre</i> , <i>Cardamine pratensis</i> , <i>Rumex acetosa</i> , <i>Stellaria alsine</i> , <i>Cirsium palustre</i> and <i>Myosotis secunda</i> .
338	314602	596918	<i>Juncus acutiflorus</i> flush (and drain) down slope, through acid grass with scattered bracken; species include <i>Ranunculus</i> spp., <i>Cardamine pratensis</i> and <i>Galium palustre</i> .
339	314900	597081	<i>Juncus squarrosus</i> grassland with few bog relics (some <i>Sphagnum capillifolium</i> ): <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Nardus stricta</i> , <i>Carex nigra</i> and <i>Luzula multiflora</i> .
340	315109	597174	Steep sided gorges with loose stones but short grazed sides with seemingly very few herbs (rare <i>Viola riviniana</i> ).
341	315391	597159	Tussocky blanket bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , <i>S. papillosum</i> , <i>Aulacomnium palustre</i> , <i>Rhytidiadelphus loreus</i> , <i>Pleurozium schreberii</i> and <i>Polytrichum</i> spp. Some drier areas (M20b) but others wetter (M18-like).
342	315391	597208	Plateau bog with tussocky graminoid vegetation: <i>Eriophorum vaginatum</i> hummocks with <i>Vaccinium myrtillus</i> and some <i>Calluna vulgaris</i> plus <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Eriophorum angustifolium</i> , <i>Sphagnum capillifolium</i> , <i>S. fallax</i> , (some <i>S. papillosum</i> ), <i>Rhytidiadelphus loreus</i> and <i>Polytrichum</i> spp.

343	315447	597140	Intermediate boggy grassland with persisting <i>Eriophorum vaginatum</i> tussocks (some moribund) with much <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Nardus stricta</i> , <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula multiflora</i> , <i>Rhytidiadelphus squarrosus</i> and occasional <i>Sphagnum</i> .
344	315531	597032	Tussocky acid grassland with tussocky, spaced, <i>Nardus stricta</i> plus <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Luzula multiflora</i> , <i>Potentilla erecta</i> , <i>Rhytidiadelphus squarrosus</i> but also graminoid wet heath elements ( <i>Trichophorum</i> , <i>Molinia</i> ) and some modified bog relics ( <i>Eriophorum vaginatum</i> , <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Sphagnum</i> ).
345	315682	596978	Bog spill into mire (with <i>Eriophorum vaginatum</i> , <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> etc).
346	315844	596981	Series of deep drains or gullies through mostly <i>Juncus acutiflorus</i> but boggy with <i>Polytrichum commune</i> and occasional <i>Sphagnum</i> ; drier ridges with acid grassland.
347	315847	597080	Extensive <i>Juncus acutiflorus</i> but mosaic of wetter marsh areas and more intermediate wet acid grassland (some <i>Deschampsia cespitosa</i> ).
348	315714	597115	Boggy vegetation with <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Carex nigra</i> , occasional <i>Trichophorum germanicum</i> , <i>Molinia caerulea</i> and <i>Calluna vulgaris</i> , with <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> and <i>Sphagnum</i> spp.
349	315557	597196	Extensive, intermediate flushed grassland with only a little <i>Eriophorum vaginatum</i> (and even rarer <i>Sphagnum</i> ) but with much <i>Carex nigra</i> plus <i>Rhytidiadelphus squarrosus</i> , <i>Anthoxanthum odoratum</i> , <i>Galium saxatile</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> and <i>Pleurozium schreberi</i> .
350	315613	597238	Local areas of increased <i>Eriophorum vaginatum</i> with <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> and <i>Sphagnum</i> .
351	315788	597253	Old dyke ridge marked by acid grassland through marshy ground; above less acidic grassland on slope but also some patches of <i>Nardus stricta</i> .
352	315800	597386	Some marked acid grassland ridges and <i>Juncus acutiflorus</i> gullies feeding the burn valley; rush extends up slope but locally intermediate with relic <i>Eriophorum vaginatum</i> tussocks.
353	315614	597330	Rather monotonous slope of drying (but flushed) bog (peat c. 25cm) with sparse <i>Eriophorum vaginatum</i> ; <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> , <i>Galium saxatile</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Hylocomium splendens</i> , <i>Pleurozium schreberi</i> and local <i>Sphagnum</i> .
354	315473	597280	Wet flushed grassland with much <i>Carex nigra</i> with <i>Nardus stricta</i> (seemingly little), <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Galium saxatile</i> , <i>Molinia caerulea</i> , <i>Anthoxanthum odoratum</i> and <i>Rhytidiadelphus squarrosus</i> .
355	315523	597399	Drying bog vegetation (peat c. 30cm) with <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Anthoxanthum odoratum</i> , <i>Carex nigra</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Polytrichum commune</i> and frequent <i>Sphagnum</i> .
356	315546	597435	Small <i>Carex nigra</i> - <i>Sphagnum</i> flushes (feeding <i>Juncus effusus</i> zones below) but <i>Eriophorum vaginatum</i> sparse with appearing as flushed wet grassland with much <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Trichophorum germanicum</i> , <i>Polytrichum commune</i> , <i>Hylocomium splendens</i> and <i>Sphagnum capillifolium</i> .
357	315338	597306	Bog with scattered but frequent tight hummocks ( <i>Sphagnum capillifolium</i> , <i>Polytrichum strictum</i> and some <i>S. papillosum</i> ).
358	315292	597338	Bog spill down slope but becoming increasingly grassy (much intermediate) with some tussocks (moribund <i>Eriophorum vaginatum</i> , and a little <i>Sphagnum</i> ) but with much <i>Carex nigra</i> , plus <i>Polytrichum commune</i> , <i>Juncus squarrosus</i> and <i>Rhytidiadelphus squarrosus</i> .



359	315365	597423	Leveller area with good bog vegetation with often vague and arbitrary edges (i.e. to dry modified bog); <i>Eriophorum vaginatum</i> with <i>Calluna vulgaris</i> plus <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> , some <i>Narthecium ossifragum</i> , and <i>Sphagnum</i> (some <i>S. papillosum</i> ) and <i>Rhytidiadelphus loreus</i> .
360	315290	597411	Wet intermediate flushed boggy grassland, difficult to classify, with <i>Carex nigra</i> , <i>Eriophorum vaginatum</i> and <i>Nardus stricta</i> plus <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Anthoxanthum odoratum</i> .
361	315019	597304	Sloping ground with varying flushed acid grassland (generally much <i>Carex nigra</i> ); above some <i>Juncus squarrosus</i> zones but others with some <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and <i>Trichophorum germanicum</i> but all with a graminoid appearance.
362	314893	597300	Leveller area with relic bog vegetation locally with good <i>Sphagnum</i> cover (some <i>S. papillosum</i> ); <i>Eriophorum vaginatum</i> with short <i>Calluna vulgaris</i> , <i>Vaccinium myrtillus</i> , <i>Eriophorum angustifolium</i> , <i>Trichophorum germanicum</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> , <i>Rhytidiadelphus loreus</i> , <i>Aulacomnium palustre</i> and <i>Polytrichum strictum</i> . Becoming drier on sloping ground (above or below).
363	314861	597302	Very wet area of <i>Sphagnum</i> ( <i>fallax</i> ) carpet with <i>S. papillosum</i> , <i>Narthecium ossifragum</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> and <i>Carex nigra</i> .
364	314926	597345	A couple of wet <i>Sphagnum fallax</i> dominated flushes (heading west to fence); with <i>Carex nigra</i> , some <i>Eriophorum vaginatum</i> or <i>Juncus squarrosus</i> , and <i>Polytrichum commune</i> .
365	314871	597366	Top of small valley feeder with <i>Juncus effusus</i> ; small population of <i>Ranunculus omiophyllus</i> just outside.
366	314874	597426	Leveller area with much <i>Juncus effusus</i> with acid grass, locally more acidic (with <i>Juncus squarrosus</i> and some <i>Sphagnum</i> ) in area between old and new fences.
367	314946	597548	Patch of leveller ground supporting relic bog (peat c. 30cm); <i>Eriophorum vaginatum</i> frequent.
368	315329	597600	Tussocky bog with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberii</i> , plus <i>Carex nigra</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> and <i>Sphagnum fallax</i> (latter forming flush zones).
369	315326	597693	<i>Juncus effusus</i> with flushed acid grassland in burn valley; above fed by several fingers of <i>Sphagnum fallax</i> flushes from bog relics above.
370	315369	597757	Bog spill (pet c. 35cm) with common <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> ), plus <i>Juncus squarrosus</i> , scarce <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , <i>Anthoxanthum odoratum</i> , <i>Rhytidiadelphus squarrosus</i> and occasional <i>Sphagnum</i> .
371	315475	597849	Tussocky graminoid bog but with some good areas of <i>Sphagnum</i> cover (mainly <i>S. fallax</i> and <i>S. capillifolium</i> ); <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Deschampsia flexuosa</i> , <i>Pleurozium schreberi</i> ) and between <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , (scarce <i>Calluna vulgaris</i> ), <i>Polytrichum commune</i> and <i>Sphagnum</i> .
372	315607	597762	Short grazed pasture with flush zones; locally enriched with <i>Lysimachia nemorum</i> , <i>Cardamine pratensis</i> , <i>Carex</i> spp., <i>Ranunculus acris</i> , <i>Viola riviniana</i> , <i>Luzula campestris</i> and <i>Prunella vulgaris</i> .
373	315549	597687	Base rich flush channel with <i>Palustriella falcata</i> (and possibly <i>P. commutata</i> ), <i>Philonotis calcarea</i> , <i>Calliergonella cuspidata</i> plus <i>Carex hostiana</i> , <i>C. demissa</i> , <i>C. dioica</i> and <i>Eriophorum angustifolium</i> .
374	315457	597610	Diverse bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Trichophorum germanicum</i> , <i>Juncus squarrosus</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum</i> spp. ( <i>S. papillosum</i> rare).

375	315398	597565	Very small, open water pool with <i>Warnstorffia fluitans</i> .
376	315706	597533	Lower slopes flushed and very short grazed with diverse sedges ( <i>Carex panicea</i> plus <i>C. pulicaris</i> , <i>C. caryophylla</i> , <i>C. leporina</i> ) and short herbs include <i>Scorzonera autumnalis</i> , <i>Plantago lanceolata</i> , <i>Viola riviniana</i> , <i>Bellis perennis</i> , <i>Lotus corniculatus</i> and some <i>Thymus polytrichus</i> .
377	315717	597603	Bog on slope with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> (possibly recovering), <i>Vaccinium myrtillus</i> , <i>Juncus squarrosus</i> , <i>Erica tetralix</i> , occasional <i>Trichophorum germanicum</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus loreus</i> and <i>Sphagnum</i> spp. (but latter mostly to flushes).
378	315834	597691	Drained bog but much <i>Eriophorum vaginatum</i> with <i>Sphagnum</i> plus <i>Polytrichum commune</i> , pleurocarp mosses, <i>Deschampsia flexuosa</i> , <i>Agrostis canina</i> , <i>Molinia caerulea</i> and <i>Vaccinium myrtillus</i> .
379	315848	597726	Deep gully with <i>Juncus acutiflorus</i> (some <i>Sphagnum</i> ); adjacent ground to north intermediate bog and <i>Juncus mire</i> .
380	315840	597763	Mixed area of mossy and tussocky acid grassland (increased <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Polytrichum commune</i> ), but some relic bog or wet heath elements.
381	315834	597838	Steep spur with small patch of heath (quite wet) but otherwise acid grassland or below <i>Juncus</i> flushing.
382	315768	598024	Mostly <i>Nardus</i> acid grassland but locally <i>Juncus acutiflorus</i> marking wetter flushing, and some areas of less acidic pasture.
383	315754	598076	<i>Eriophorum vaginatum</i> graminoid bog plus <i>Polytrichum commune</i> , <i>Sphagnum palustre</i> , <i>Erica tetralix</i> , <i>Agrostis canina</i> , <i>Deschampsia flexuosa</i> , occasional <i>Calluna vulgaris</i> ; mossy acid grass up to wall.
384	315745	598131	<i>Eriophorum</i> bog but with much moss and <i>Juncus squarrosus</i> .
385	315654	598196	Intermediate wet mossy acid grassland with relic bog (former extends up slope to wall and becoming drier, latter below); local <i>Juncus effusus</i> lines marking drains and flushes.
386	315580	598250	Rocky outcrop with shorter grazed pasture but seemingly little herb diversity; local <i>Juncus effusus</i> patches.
387	315453	598220	Level area of wetter bog with <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> , <i>Erica tetralix</i> and <i>Sphagnum</i> (some <i>S. papillosum</i> ); very wet to centre with <i>Sphagnum</i> carpet plus <i>Aulacomnium</i> and <i>Narthecium ossifragum</i> .
388	315430	598050	Extensive tussocky graminoid bog on gentle slope but with some <i>Sphagnum</i> , locally frequent and some <i>S. papillosum</i> ; <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Eriophorum angustifolium</i> , <i>Molinia caerulea</i> , and <i>Polytrichum commune</i> .
389	315156	597894	Slope with wet acid grassland (frequent <i>Juncus squarrosus</i> ) but below very steep with <i>Nardus stricta</i> and <i>Vaccinium myrtillus</i> plus some <i>Trichophorum germanicum</i> and <i>Molinia caerulea</i> and <i>Rhytidiadelphus squarrosus</i> , <i>Pleurozium schreberi</i> and <i>Hylocomium splendens</i> .
390	315014	597892	Steep slope with shallowing graminoid peaty vegetation: <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Carex binervis</i> , <i>C. panicea</i> , <i>Vaccinium myrtillus</i> , <i>Potentilla erecta</i> , local <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , and abundant pleurocarp mosses.
391	315068	598024	Steep burn sides with short grassland and occasional flush (some with <i>Palustriella commutata</i> , <i>Carex</i> spp., <i>Briza media</i> and <i>Pinguicula vulgaris</i> ); burn with some <i>Juncus effusus</i> and local <i>Chrysosplenium oppositifolium</i> .
392	315045	598061	Isolated block of graminoid peaty grassland but on closer inspection with much <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> and <i>Calluna vulgaris</i> (i.e. wet heath precursors).



393	314994	598089	Graminoid peaty grassland ( <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> ) but with many heath elements ( <i>Vaccinium myrtillus</i> , <i>Trichophorum germanicum</i> , and occasional short <i>Calluna vulgaris</i> and <i>Sphagnum capillifolium</i> ) plus <i>Polytrichum commune</i> and pleurocarp mosses.
394	315273	598283	Spill of mostly acid grassland (but peat c 25cm) with only occasional <i>Eriophorum vaginatum</i> relic tussocks; <i>Carex nigra</i> , <i>Nardus stricta</i> , <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Juncus squarrosus</i> , <i>Luzula multiflora</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> and <i>Rhytidiadelphus squarrosus</i> .
395	315390	598370	Extensive tussocky graminoid: <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Carex nigra</i> , <i>Anthoxanthum odoratum</i> , <i>Sphagnum fallax</i> , <i>S. capillifolium</i> and <i>Polytrichum commune</i> ; rare <i>Calluna vulgaris</i> , <i>Trichophorum germanicum</i> or <i>Sphagnum papillosum</i> .
396	315365	598621	Leveller summit area with wetter bog (frequent <i>Sphagnum papillosum</i> and some large <i>S. capillifolium</i> hummocks).
397	315272	598678	Tussocky graminoid bog: <i>Eriophorum vaginatum</i> tussocks (with <i>Vaccinium myrtillus</i> , <i>Pleurozium schreberi</i> ) plus <i>Juncus squarrosus</i> , <i>Calluna vulgaris</i> , <i>Carex nigra</i> , <i>Deschampsia flexuosa</i> , <i>Anthoxanthum odoratum</i> , <i>Polytrichum commune</i> <i>Rhytidiadelphus squarrosus</i> and spp.
398	315147	598666	Lower-lying block of wetter bog with much <i>S. fallax</i> and <i>S. papillosum</i> , plus <i>Juncus squarrosus</i> , <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Carex nigra</i> .
399	315332	598860	Shaded ride with tussocky <i>Eriophorum vaginatum</i> , <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> (favoured by shade) and some <i>Sphagnum</i> ; past felled area to east with dense cover of <i>Calluna vulgaris</i> , with <i>Eriophorum vaginatum</i> , <i>Vaccinium myrtillus</i> , <i>Polytrichum commune</i> and <i>Pleurozium schreberi</i> .
400	315209	598459	Narrow spill of <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> and <i>Polytrichum commune</i> (linked to bog slump above).
401	315121	598532	Weak spill of boggy relic with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> (and acidic grassland species).
402	314975	598270	Mossy (pleurocarps and <i>Polytrichum commune</i> ) acid grassland ( <i>Nardus stricta</i> , <i>Juncus squarrosus</i> , <i>Agrostis canina</i> , <i>Molinia caerulea</i> ) but with <i>Molinia caerulea</i> , <i>Trichophorum germanicum</i> and rare <i>Eriophorum vaginatum</i> tussocks.
403	315006	598314	Relic <i>Eriophorum vaginatum</i> tussocks with <i>Polytrichum commune</i> , plus occasional <i>Sphagnum capillifolium</i> , plus <i>Juncus squarrosus</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> and <i>Agrostis canina</i> .
404	314951	598476	Wetter spill down to fence (with some <i>Eriophorum vaginatum</i> ) and continues as flush over fence (wet acid grassland).
405	314918	598582	Steep slope with acid grassland ( <i>Nardus stricta</i> , <i>Molinia caerulea</i> , <i>Vaccinium myrtillus</i> , <i>Agrostis</i> spp., <i>Juncus squarrosus</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Polytrichum commune</i> , <i>Rhytidiadelphus squarrosus</i> , and rare <i>Calluna vulgaris</i> , <i>Sphagnum capillifolium</i> and <i>Trichophorum germanicum</i> (latter more so below).
406	314820	598526	Top of feeder burn meets peaty edges; <i>Juncus effusus</i> with wet acid grassland; burn with <i>Stellaria alsine</i> and some <i>Callitriche stagnalis</i> .
407	314467	598578	Small <i>Juncus acutiflorus</i> marsh ( <i>Carex</i> spp., <i>Calliergonella cuspidata</i> ) and wider wet flushed grassland (rest of pasture somewhat enriched with <i>Cynosurus cristatus</i> and <i>Cirsium arvense</i> , and occasional bracken).
408	314343	598772	Burn with short steep sides through somewhat enriched pasture; a few patches of scrub (hawthorn and willow), bracken and male fern.
409	314438	598775	Valley with dense scrub of willow below (and locally above); steep sides with grassland and bracken (some <i>Molinia</i> to plantation edges above).
410	314155	599145	Roadside embankment with gravel heather cover.

411	314277	599219	Hard to access narrow glade on steep slope with acid grassland and large patches of bracken (more so below). Not visited.
412	314376	599469	Steep sided valley with scrubby birch and willow woodland; steep slope above with dense bracken and local heather patches.
413	314709	596490	Small spring (below <i>Molinia mire</i> relic above) with <i>Philonotis</i> and <i>Palustriella</i> , plus <i>Carex</i> spp.

## Target notes for north eastern area with Rue Gill Hill, Ewelairs Hill and Pot Hill

1	315843	600391	Ridge top with relic tussocky bog but heather dominated with local to frequent <i>Eriophorum vaginatum</i> with hypnoid mosses and some <i>Sphagnum capillifolium</i> plus <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Vaccinium vitis-idaea</i> , <i>Eriophorum angustifolium</i> and some <i>Neottia (Listera) cordata</i> .
2	315985	600482	More bog relics but still heather-dominated (heath like) with occasional <i>Eriophorum vaginatum</i> and <i>Sphagnum capillifolium</i> plus <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> and hypnoid mosses.
3	315916	600567	Heather dominated slope on shallow to local deeper peats, with <i>Vaccinium myrtillus</i> , some <i>V. vitis-idaea</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Potentilla erecta</i> and hypnoid mosses; rare <i>Eriophorum vaginatum</i> or <i>Sphagnum capillifolium</i> relics (more bog relics above where less steep)
4	316218	600643	Species rich flushed grassland with <i>Carex</i> spp., <i>Galium uliginosum</i> , <i>Ajuga reptans</i> , <i>Geum rivale</i> , <i>Galium verum</i> , <i>Conopodium majus</i> and <i>Primula vulgaris</i> .
5	316256	600645	Wet tussocky wet heath dominated by <i>Molinia caerulea</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses plus some heather (peat c. 20cm).
6	316033	600726	Heather dominated gentle ledges with <i>Vaccinium myrtillus</i> plus occasional <i>Erica tetralix</i> , <i>Molinia caerulea</i> and hypnoid mosses and some <i>Sphagnum</i> (some <i>S. russowii</i> ); peat 30+ cm. Population of <i>Neottia (Listera) cordata</i> .
7	315857	600639	Steepening slope but with a similar appearing (to below) shrubby heather dominated canopy; <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses but on fairly deep peat (c. 25cm) indicating bog spill origins from above.
8	315866	600721	Deep peat but dominated by shrubby <i>Calluna vulgaris</i> with only rare <i>Eriophorum vaginatum</i> ; with <i>Vaccinium myrtillus</i> and hypnoid mosses plus rare or occasional <i>Molinia caerulea</i> , <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
10	315831	600725	Tussocky bog in shallow valley head dominated by tall and tussocky heather with occasional <i>Eriophorum vaginatum</i> , and much hypnoid mosses (some <i>Sphagnum</i> ) plus occasional <i>Erica tetralix</i> and <i>Empetrum nigrum</i> ; frequent erosion gullies and ridges.
11	315835	600770	Rising slope with less <i>Eriophorum vaginatum</i> (restricted to wetter flush lines) but on deep peat; dominated by tussocky heather with some <i>Vaccinium myrtillus</i> and hypnoid mosses (occasional <i>Sphagnum</i> ) plus some <i>Eriophorum angustifolium</i> , <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> and <i>Empetrum nigrum</i> .
12	315831	600914	Area of heather dieback with increased <i>Eriophorum vaginatum</i> and <i>Vaccinium myrtillus</i> plus hypnoid mosses and <i>Erica tetralix</i> , <i>Eriophorum angustifolium</i> ; some erosion gullies (less hidden due to reduced heather).
13	315898	601012	Gentle slope dominated by heather with little <i>Eriophorum vaginatum</i> but on deep peat (40cm) and some erosion type gullies or edges; hypnoid mosses common but <i>Sphagnum</i> infrequent; gullies or flushes with <i>Molinia caerulea</i> , <i>Narthecium ossifragum</i> and some <i>Eriophorum vaginatum</i> .
14	316289	601117	<i>Eriophorum vaginatum</i> becoming rare but local in the fingers of erosion gullies down slope (some <i>Carex nigra</i> , and <i>Juncus</i> ).
15	316318	601160	<i>Calluna vulgaris</i> dominated heath with <i>Vaccinium myrtillus</i> ; no <i>Eriophorum vaginatum</i> but on deep peat, and some local <i>Rubus chamaemorus</i> .
16	316230	601228	Bog pool with <i>Sphagnum fallax</i> and <i>Eriophorum</i> spp.; but also curiously some wet acid grassland (bent fescue type); various erosion gullies and slight hags above.
17	316170	601234	Broad cover of shrubby heather dominated bog with occasional <i>Eriophorum vaginatum</i> plus <i>Vaccinium myrtillus</i> , <i>Empetrum nigrum</i> , <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> with much hypnoid moss and some <i>Sphagnum capillifolium</i> plus

			<i>Ptilidium ciliare</i> .
18	316002	601323	Heather dominated bog; here small wetter area with <i>Sphagnum papillosum</i> .
19	316186	601349	Species-rich flushed grassland (some <i>Juncus</i> zones) with <i>Carex</i> spp., (some <i>C. caryophylla</i> , <i>C. pulicaris</i> ), <i>Lysimachia nemorum</i> , <i>Succisa pratensis</i> , <i>Conopodium majus</i> , <i>Geum rivale</i> and <i>Angelica sylvestris</i> .
20	316233	601389	Flushed species rich grassland on lower slopes with much <i>Carex panicea</i> and some <i>Nardus stricta</i> but also <i>Carex flacca</i> , <i>Avenula pubescens</i> , <i>Conopodium majus</i> , <i>Anemone nemorosa</i> , <i>Filipendula ulmaria</i> , <i>Ajuga reptans</i> and others noted above.
21	316205	601431	Scree (mostly loose and acidic with <i>Pogonatum urnigerum</i> ); adjacent grassland diverse with <i>Avenula pubescens</i> , <i>Potentilla sterilis</i> , <i>Anemone nemorosa</i> , <i>Carex flacca</i> and <i>Galium sternerii</i> .
22	316260	601478	Extensive flushed grassland (grey blue sheen from <i>Carex</i> spp.) with <i>Conopodium majus</i> , <i>Avenula pubescens</i> , <i>Deschampsia cespitosa</i> , <i>Holcus mollis</i> and <i>Poa humilis</i> .
24	316038	601372	Bog on slope but shallower peat and reduced, patchy <i>Eriophorum vaginatum</i> ; mostly hypnoid mosses with <i>Vaccinium myrtillus</i> , and occasional <i>Erica tetralix</i> , <i>Empetrum nigrum</i> and <i>Vaccinium vitis-idaea</i> .
25	316091	601488	Large flushed grassland with <i>Carex panicea</i> plus <i>Juncus conglomeratus</i> plus some <i>Avenula pubescens</i> and <i>Carex pulicaris</i> .
26	316150	601541	Species rich flushes with <i>Carex</i> spp., <i>Ajuga reptans</i> , <i>Lysimachia nemorosa</i> , <i>Crepis paludosa</i> , <i>Silene flos-cuculi</i> , <i>Geum rivale</i> ; some spring like flushing with <i>Chrysosplenium oppositifolium</i> , <i>Philonotis fontana</i> and <i>Dicranella palustris</i>
27	316145	601587	Small stony scree; adjacent heath and grass with some bluebell.
28	316053	601634	Shallower peat on slope with short heather plus hypnoid mosses, <i>Empetrum nigrum</i> and <i>Vaccinium</i> spp.; <i>Eriophorum</i> restricted to depressions or locally by the fence
29	316081	601711	Shallow to deep peat dominated by <i>Calluna vulgaris</i> and no or rare <i>Eriophorum vaginatum</i> but presumably bog relic.
30	316073	601748	More bog-like vegetation but very dry with heather with <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> but little <i>Eriophorum vaginatum</i> (peat 30+ cm).
31	316092	601802	Erosion gullies (some <i>Narthecium ossifragum</i> ) and edges with scattered <i>Eriophorum vaginatum</i> and occasional <i>Sphagnum capillifolium</i> and on deep peat (40cm) but dominated by shrubby heather.
32	316233	601921	Deep peat edge (2m) but similar heather dominated vegetation to either side, though below there are frequent erosion gullies and ridges (but some above).
33	316227	601943	Series of narrow flush lines below peat edge with wet grass ( <i>Nardus stricta</i> ) and much <i>Cirsium palustre</i> .
34	316230	601984	Undulating eroded bog on deep peat (some shallower in depressions); heather-dominated (and hypnoid moss) with <i>Eriophorum vaginatum</i> and <i>Sphagnum</i> mostly rare below.
35	316347	601966	Vegetation more even on gently sloping ground and gradually grading from heather dominated bog to heather dominated heath (rather arbitrary distinction); more obvious heath or wet heath below to valley head
36	316351	602107	Broad level area of undulating bog with many gullies and ridges, but generally dry and heather dominated and very tussocky; <i>Eriophorum vaginatum</i> local (mainly to gullies, where some <i>Narthecium ossifragum</i> and more <i>Sphagnum</i> ).
37	316400	602234	Slopes with rather intermediate bog or heath vegetation both dominated by heather (peat c. 30cm +) with <i>Vaccinium</i> spp, <i>Eriophorum angustifolium</i> , <i>Erica tetralix</i> and some <i>Molinia caerulea</i> (but rare <i>Eriophorum vaginatum</i> ).
38	316354	602239	Intermediate heath or bog dominated by shrubby heather with hypnoid moss and no <i>Eriophorum vaginatum</i> (except locally).
39	316336	602286	Deep peat and some <i>Eriophorum vaginatum</i> and locally <i>Rubus chamaemorus</i> but all

			heather dominated and heath-like.
40	316242	602352	Flushed grassland some with much <i>Carex nigra</i> but also local <i>Eriophorum vaginatum</i> and <i>Molinia caerulea</i> (fed by weak spill from bog above by fence).
41	316271	602365	Bog strip by fence (more <i>Eriophorum vaginatum</i> to west side) but grading on east side to monotonous heather domination; locally much <i>Rubus chamaemorus</i> .
42	316411	602604	Extensive monotonous cover of <i>Calluna vulgaris</i> (but no peat c. 20cm); some <i>Melampyrum pratense</i> here.
43	316403	602661	Slopes with shallower peat (some to 20cm though) with no <i>Eriophorum vaginatum</i> (some above); heather dominated with <i>Vaccinium myrtillus</i> and hypnoid mosses; boggier to central valley and some wet heath-like patches.
44	316372	602796	Bog edges and depressions (erosion) with locally <i>Eriophorum vaginatum</i> and <i>Narthecium ossifragum</i> in lower flushes; <i>Rubus chamaemorus</i> frequent.
45	316341	602788	Bog with much <i>Rubus chamaemorus</i> ; mostly dominated by <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and <i>Eriophorum vaginatum</i> (but sparingly), with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , and hypnoids with frequent <i>Rhytidiadelphus loreus</i> .
46	316396	602862	Bog pool ( <i>Sphagnum fallax</i> , and some <i>S. papillosum</i> ).
47	316448	602944	Small bog pool ( <i>Eriophorum vaginatum</i> with <i>Sphagnum fallax</i> ); much <i>Rubus chamaemorus</i> in surrounding bog.
48	316484	603041	Bog with much <i>Rubus chamaemorus</i> , plus <i>Narthecium ossifragum</i> , <i>Erica tetralix</i> and frequent <i>Sphagnum</i> ; deep drain to edge.
49	316599	602981	Extensive monotonous <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> and hypnoid mosses; dry heath like but with some deep peat (>25cm) indicating drying bog affinities.
50	316450	603262	Shrubby heather dominated dry bog but only local area at ridge summit with some <i>Eriophorum vaginatum</i> .
51	316654	603365	Small stream meets road (to north of here), where some <i>Saxifraga stellaris</i> ; <i>Thymus</i> frequent in roadside gravels.
52	316947	601247	Steep slope with mosaic or intermediate acid grassland and <i>Vaccinium</i> heath (scarce <i>Calluna</i> or wet heath elements).
53	317080	601265	Steeper slope to summit with much <i>Vaccinium myrtillus</i> (with <i>Pleurozium schreberi</i> and <i>Deschampsia flexuosa</i> ) parallel fence, with acid grassland further away (locally flushes with <i>Carex nigra</i> ); some <i>Festuca vivipara</i> .
54	317064	601411	Steep slope with acid grass and <i>Vaccinium myrtillus</i> but some increasing wet heath elements and flushing ( <i>Carex nigra</i> ).
55	316909	601468	Steep slope with an acid grassland and heath cover, often in mosaics; below some wet heath (and much <i>Molinia</i> nearer fence).
56	316790	601453	Valley floor with drained and more fertile grassland locally with some herb diversity, but also some acid relics and frequent <i>Juncus acutiflorus</i> flushes and strips (larger upstream); some <i>Cirsium helenoides</i> .
57	316977	601573	<i>Molinia caerulea</i> common with some <i>Calluna vulgaris</i> and <i>Trichophorum germanicum</i> , but also grassy with much <i>Agrostis vinealis</i> and <i>Deschampsia flexuosa</i> (and frequent <i>Vaccinium myrtillus</i> ).
58	317066	601653	Extensive slope with mosaic of <i>Molinia tussocks</i> and acid grasses all with <i>Vaccinium myrtillus</i> , but the latter forming distinct heathy patches (with <i>Deschampsia flexuosa</i> and <i>Pleurozium schreberi</i> ).
59	317168	601542	Peaty spill with <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> plus <i>Empetrum nigrum</i> and <i>Erica tetralix</i> .
60	317176	601559	Boggy spill of mostly <i>Calluna vulgaris</i> with <i>Vaccinium myrtillus</i> , hypnoid mosses and occasional <i>Erica tetralix</i> and <i>Eriophorum vaginatum</i> (peat 30cm+).

61	317237	601632	Extensive area of tussocky <i>Molinia</i> vegetation with <i>Vaccinium myrtillus</i> , <i>Galium saxatile</i> , <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> , <i>Anthoxanthum odoratum</i> , <i>Deschampsia flexuosa</i> , <i>Agrostis vinealis</i> and some <i>Festuca vivipara</i> .
62	317332	601737	Strip of bog vegetation (very uneven) locally with much <i>Sphagnum</i> (but seeming mostly <i>S. palustre</i> ); <i>Calluna</i> with <i>Eriophorum vaginatum</i> plus <i>Empetrum nigrum</i> and <i>Vaccinium myrtillus</i> , and also <i>Carex nigra</i> and acid grassland elements at erosion edges.
63	317401	601842	Edge of bog with some gullies, locally with <i>Carex rostrata</i> ; also some <i>Carex bigelowii</i> .
64	317507	601856	Diverse bog with <i>Vaccinium vitis-idaea</i> , <i>Empetrum nigrum</i> , <i>Eriophorum</i> spp., <i>Erica tetralix</i> , <i>Rubus chamaemorus</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>Polytrichum strictum</i> and <i>Aulacomnium palustre</i> .
65	317474	601867	Flushed grassland by bog with much <i>Carex bigelowii</i> (plus <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> and <i>Vaccinium myrtillus</i> ).
66	317390	601910	Top of steep valley with big patch of <i>Luzula sylvatica</i> ; mostly acidic grassland but with much <i>Carex nigra</i> and some heath elements
67	317649	601967	Bog with <i>Vaccinium vitis-idaea</i> , <i>Eriophorum</i> spp., <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> , <i>Polytrichum strictum</i> .
68	317724	602202	Disturbed (tracks and deep drains) parallel fence with bog elements but much acidic grassland ( <i>Carex nigra</i> , <i>Polytrichum commune</i> , <i>Deschampsia flexuosa</i> , <i>Vaccinium</i> spp.).
69	317680	602252	Steep slope with a mosaic of acid grassland and patches of <i>Vaccinium myrtillus</i> ; species include <i>Festuca ovina</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>C. binervis</i> , <i>Galium saxatile</i> , <i>Potentilla erecta</i> and mosses <i>Pleurozium schreberi</i> , <i>Hylocomium splendens</i> and <i>Rhytidiadelphus squarrosus</i> .
70	317758	602321	Isolated relic of bog but with some <i>Rubus chamaemorus</i> plus <i>Vaccinium vitis-idaea</i> and <i>Sphagnum capillifolium</i> .
71	317755	602512	Relic area of disturbed bog with <i>Vaccinium</i> spp., <i>Eriophorum</i> sp., <i>Calluna vulgaris</i> , <i>Empetrum nigrum</i> but also acid grassland elements; some <i>Melampyrum pratense</i> noted.
72	317687	602507	Wet heath spill and flushed acid grassland with <i>Vaccinium myrtillus</i> , <i>Molinia caerulea</i> , <i>Agrostis vinealis</i> , <i>Deschampsia flexuosa</i> , <i>Carex nigra</i> , <i>C. panicea</i> and hypnoid mosses.
73	317609	602572	Erosion gully with <i>Carex nigra</i> , <i>C. echinata</i> , and some <i>C. pulicaris</i> and <i>Cirsium palustre</i> .
74	317589	602580	Extensive bog on level area but sloping and eroding gullies to the west: <i>Calluna vulgaris</i> , <i>Eriophorum vaginatum</i> , <i>Vaccinium</i> spp., <i>Erica tetralix</i> , <i>Empetrum nigrum</i> , <i>Sphagnum capillifolium</i> , <i>S. papillosum</i> and hypnoid mosses.
75	317543	602593	Hollow with <i>Carex rostrata</i> and <i>Sphagnum</i> extending down slope in flushed channel; with <i>Carex echinata</i> , <i>C. nigra</i> , <i>Eriophorum angustifolium</i> and <i>Polytrichum commune</i> .
76	317478	602670	Relic bog with some <i>Eriophorum vaginatum</i> , <i>Sphagnum capillifolium</i> , <i>Vaccinium vitis-idaea</i> and <i>Rubus chamaemorus</i> .
77	317353	602754	Shallow valley with <i>Eriophorum vaginatum</i> and <i>Polytrichum commune</i> but also flushed <i>Carex nigra</i> , <i>C. echinata</i> , <i>Agrostis vinealis</i> , <i>Molinia caerulea</i> and below <i>Juncus effusus</i> .
78	317263	602802	Tussocky bog on slope dominated by <i>Calluna vulgaris</i> with some <i>Vaccinium myrtillus</i> , with little <i>Eriophorum vaginatum</i> ; peat often deeper than 30cm but vegetation appearing heath-like.
79	317224	602748	Broad strip down to valley with flushed acid grassland (much <i>Agrostis vinealis</i> , <i>Carex panicea</i> , <i>Nardus stricta</i> , <i>Deschampsia flexuosa</i> and occasional <i>Juncus effusus</i> ).
80	317100	602857	Shallow valley with acid grassland ( <i>Agrostis vinealis</i> , <i>Carex nigra</i> , <i>Anthoxanthum</i>



			odoratum, <i>Nardus stricta</i> ) and some heath islets.
81	316862	602884	Flushed grassland with some <i>Nardus stricta</i> and <i>Deschampsia cespitosa</i> plus <i>Carex</i> spp (some <i>C. pulicaris</i> ), <i>Conopodium majus</i> and <i>Avenula pubescens</i> .
82	317203	602966	Upper area mostly level and appearing dry with little <i>Eriophorum vaginatum</i> obvious, and several finger like ridges and gullies (where more wet, or dry, heath elements and some acid grassland, flushed or drier); <i>Calluna</i> dominates with <i>Vaccinium</i> spp., <i>Empetrum nigrum</i> , occasional <i>Molinia caerulea</i> and mostly hypnoid mosses.
83	317228	602974	Enormous <i>Sphagnum capillifolium</i> hummock (3m x 2m x 1m tall).
84	317227	603014	Wetter hollow with increased <i>Eriophorum vaginatum</i> and also some <i>Sphagnum papillosum</i> ; some <i>Rubus chamaemorus</i> .
85	317129	603011	Erosion gully or valley with more <i>Eriophorum vaginatum</i> but also <i>Carex nigra</i> , <i>Nardus stricta</i> , <i>Agrostis vinealis</i> and <i>Deschampsia flexuosa</i> ; splits below where flushed acidic grassland and local <i>Juncus effusus</i> patches.
86	317201	603101	Leveller area of shallower peat with abundant <i>Calluna vulgaris</i> but more <i>Molinia caerulea</i> , plus some <i>Empetrum nigrum</i> , <i>Erica tetralix</i> , <i>Vaccinium</i> spp, <i>Eriophorum angustifolium</i> and rare <i>Eriophorum vaginatum</i> (more so to lower-lying areas).
87	317062	603168	Shallower slope below drier ridge, deeper peat but similar-appearing <i>Calluna vulgaris</i> -dominated heath vegetation (local <i>Eriophorum angustifolium</i> , rare <i>E. vaginatum</i> and some <i>Empetrum nigrum</i> ).
88	317227	603403	East of fence some wet heath, or bog, relics with locally much <i>Vaccinium vitis-idaea</i> .
89	317034	603407	Broad valley like gully with flushed <i>Nardus stricta</i> grassland with <i>Carex</i> spp, and above some channels with <i>Carex rostrata</i> ; further up the gully is more bog like but with some acid grassland elements.
90	317230	603607	East of fence some local bog relics mixed in with acid grassland; here some odd <i>Sphagnum capillifolium</i> cones.
91	317115	603658	Bog with abundant <i>Rubus chamaemorus</i> and local <i>Sphagnum</i> .
92	317107	603717	Broad strip of wetter bog (appears >40cm) with frequent <i>Eriophorum vaginatum</i> and some <i>Rubus chamaemorus</i> .

#### Target notes for additional areas survey in 2020

1	309634	599226	SUDS pond (much <i>Phragmites</i> plus <i>Typha</i> and <i>Juncus acutiflorus</i> ) with colonizing willow and alder to margins; set adjacent to huge manure heap.
2	309739	599020	Small fenced off SUDS ponds (eastern one with <i>Phragmites</i> ).
3	310000	598887	<i>Juncus acutiflorus</i> dominated marsh here, quite diverse with <i>Angelica sylvestris</i> , <i>Ajuga reptans</i> , <i>Caltha palustris</i> , <i>Cirsium palustre</i> , <i>Ranunculus repens</i> and <i>Calliergonella cuspidata</i> ; <i>Juncus effusus</i> dominates further east. A few rough grass ridges occur but these tend to become coarse ( <i>Dactylis glomerata</i> , <i>Centaurea nigra</i> , <i>Anthriscus sylvestris</i> ).
4	310050	598823	Drain and small pool (some <i>Phalaris</i> and <i>Typha</i> ) in otherwise inundated <i>Juncus effusus</i> dominated marsh (seems low diversity).
5	310165	598637	<i>Juncus effusus</i> dominated marsh (inundated) with some <i>Phalaris</i> , <i>Ranunculus flammula</i> and <i>Calliergon cordifolium</i> ; adjacent grassland appears to be neutral (rather than acidic) but tending to be grass dominated (some <i>Rumex acetosa</i> , <i>Ranunculus acris</i> , <i>Plantago lanceolata</i> and <i>Veronica chamaedrys</i> ).

6	310143	598581	Bridge over railway, the sides of the latter with adjacent parallel swale supporting gravel or rough grass (and tall herbs) and much scrub (broom, birch and willow); rank grass to railway banks.
7	310103	598434	Low-lying mire dominated by <i>Juncus acutiflorus</i> with <i>Rumex acetosa</i> , <i>Ranunculus repens</i> , <i>Myosotis</i> sp., <i>Ranunculus omiophyllus</i> , <i>Caltha palustris</i> and the moss <i>Calliergonella cuspidata</i> . <i>Juncus effusus</i> increases to the south near the wall (and down to railway).
8	310264	599148	Narrow marsh or swamp channel below steep bank; <i>Filipendula ulmaria</i> common to the drier margin but <i>Phalaris</i> , <i>Agrostis stolonifera</i> and <i>Glyceria fluitans</i> frequent to the wetter channel; some <i>Carex disticha</i> present.
9	310338	599008	<i>Juncus effusus</i> marsh in small valley but fairly dry with limited associates; adjacent grassland with scattered to frequent <i>Juncus effusus</i> (more so above),
10	310439	598566	Waste ground area (dumping of agricultural wastes and lime mounds), with some short open turf: <i>Trifolium</i> spp., <i>Hypochoeris radicata</i> , <i>Prunella vulgaris</i> , <i>Aphanes arvensis</i> s.l. and mosses such as <i>Racomitrium canescens</i> and <i>Polytrichum juniperum</i> ; also some broom scrub.
11	310455	598632	Old quarry area now fenced off and with a poorly draining but somewhat enriched pasture; <i>Juncus effusus</i> prominent but much recently topped (and currently high stock density).
12	310215	597891	Area of <i>Carex rostrata</i> dominated swamp with <i>Juncus</i> spp. mire to margins (some <i>Phalaris</i> ); very difficult to access due to high water.
13	310247	597957	<i>Juncus effusus</i> dominated pasture but hardly marshy, and appearing to be of limited herb diversity
14	310547	598467	Swamp with <i>Phalaris</i> and some <i>Typha</i> , grading to <i>Juncus effusus</i> dominated wet grassland, locally gravelly with more diversity.
15	310626	598453	Area of periodically flooded grassland (relatively less improved) between riverbank (alder and a few herbs), and raised embankment (topped by mature oak or beech and much broom scrub)
16	310579	598644	Open water of lagoon fringed by very dense willow and alder (and some broom) scrub; some new tree planting to the north. Inundated margins to lagoon (level currently very high) but appears to be steep sided with poor marginal flora.
17	310662	598543	Levee bank between river and lagoon, mostly with dense <i>Rubus</i> spp or <i>Juncus effusus</i> , or developing scrub (more so to the lagoon edge); riverbanks (both sides) with narrow fringe of alder woodland.
18	311313	599346	Small valley with steep sides (and waterfall) with a few relic mature trees (some oak, rowan and willow) plus bracken and other ferns, moss and some <i>Primula vulgaris</i> and <i>Luzula sylvatica</i> .
19	311214	599403	<i>Juncus acutiflorus</i> dominated marshy slopes in otherwise enriched pasture (but often poorly draining, and badly poached below); associates include <i>Montia fontana</i> , <i>Cirsium palustre</i> , <i>Rumex acetosa</i> , <i>Galium palustre</i> , <i>Ranunculus</i> spp (include some <i>R. omiophyllus</i> ½ indicating persistent pooling), and mosses such as <i>Calliergonella cuspidata</i> and <i>Brachythecium rivulare</i>
20	311314	599549	Lower slopes with <i>Juncus acutiflorus</i> mire (locally with some <i>Carex</i> spp., and <i>Potamogeton polygonifolius</i> ); above is enriched pasture but to the leveller ridge further above the pasture is poorly draining with much <i>Juncus effusus</i> (some topped).



21	311352	599937	Broad ridge on gentle slope variously enriched and improved but very wet and poorly draining with locally abundant <i>Juncus effusus</i> (although much has been topped).
22	311486	600801	Very wet and poached pasture with some <i>Juncus effusus</i> (but topped or grazed back). Slope below very wet but increasing <i>Juncus effusus</i> below towards wetter hollow (but not marsh vegetation).
23	311634	600692	Narrow drain separates <i>Juncus effusus</i> dominated marshy pasture in low-lying area; herb diversity appears low (much poaching and enrichment)
24	311974	600617	<i>Molinia</i> dominates but here locally with frequent <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> (i.e. wet heath affinity) plus <i>Erica tetralix</i> , <i>Juncus squarrosus</i> , <i>Narthecium ossifragum</i> , <i>Sphagnum capillifolium</i> and <i>Hylocomium splendens</i> ; grades below to wetter mire conditions (including increasing <i>Juncus acutiflorus</i> )
25	312078	600575	Several small ridges with acidic grassland and here with short <i>Calluna vulgaris</i> and <i>Vaccinium myrtillus</i> plus much <i>Hylocomium splendens</i> and occasional <i>Carex binervis</i> .
26	312094	600571	Wet <i>Molinia</i> mire (not really wet heath) but with some <i>Calluna vulgaris</i> , <i>Erica tetralix</i> , <i>Narthecium ossifragum</i> , <i>Carex</i> spp., and <i>Sphagnum</i> .
27	312133	600331	Large area of low-lying tussocky <i>Molinia</i> dominated mire (with some heath elements) but also <i>Juncus acutiflorus</i> dominated flushes and channels.
28	312209	600475	Boulder and stone scree with acidic grassland and bracken plus occasional dry heath element (some <i>Erica cinerea</i> ), various mosses ( <i>Racomitrium</i> spp., <i>Dicranum</i> etc.) and lichens ( <i>Parmelia</i> spp., <i>Sphaerophorus</i> , and crustose types).
29	314010	599409	Edge of large area of low-lying <i>Juncus acutiflorus</i> mire (with <i>Calliergonella cuspidata</i> , plus <i>Rhytidiadelphus squarrosus</i> , <i>Rumex acetosa</i> , <i>Cirsium palustre</i> , <i>Molinia caerulea</i> and <i>Caex</i> spp.).
30	314136	599810	Burn valley to either side of bridge with developing scrub (mainly willows) with coarse grass glades and occasional heather patch; <i>Luzula sylvatica</i> to side with some male fern but seemingly few woodland elements.
31	314146	599983	Broad level area dominated by heather over hypnoid mosses, but local too dense patches of <i>Sphagnum</i> moss, giving a wet heath appearance.
32	315767	601034	<i>Vaccinium vitis-idaea</i> frequent in bog vegetation
33	315972	601014	Some <i>Lycopodium clavatum</i> to the track edge
34	315836	602353	The club-moss species present: <i>Lycopodium clavatum</i> , <i>Huperzia selago</i> and <i>Diphasiastrum alpinum</i> .
35	315885	602415	Gravelly heather margins locally with diverse club-moss populations ( <i>Lycopodium clavatum</i> most widespread but some <i>Huperzia selago</i> and <i>Diphasiastrum alpinum</i> ).
36	315982	602888	Large patch of broom to the track side (and scattered further down track) but track sides mostly dominated by heather and mosses; several patches of <i>Lycopodium clavatum</i> noted.
37	316055	603084	Steep sided valley with bracken dominating the northern side, but acid grass and heather to the southern.
38	316078	603133	Lower slope with <i>Molinia caerulea</i> and pine relics
39	316111	603214	Narrow glade with dead pines and much heather dieback and patches of mossy grassland, and frequent <i>Vaccinium myrtillus</i> .
40	316200	603275	Flushed acid grassland area in otherwise heather dominated area (one patch of <i>Luzula sylvatica</i> ).

41	316388	603210	<i>Vaccinium vitis-idaea</i> frequent
42	316700	603313	Water course slope with much flushing, some rush dominated but others with wet grassland (some <i>Nardus stricta</i> and <i>Carex panicea</i> ).
43	316871	601700	Broad area of <i>Juncus acutiflorus</i> mire, mostly minerotrophic but with some patches of <i>Sphagnum</i> (and occasional heather).
44	316858	601633	<i>Juncus effusus</i> marsh (flattened by erosion, and with some deep erosion channels to the southeast); associates include <i>Ajuga reptans</i> , <i>Chrysosplenium oppositifolium</i> and <i>Ficaria verna</i> .
45	316810	601543	Tussocky acid grass with <i>Agrostis capillaris</i> and <i>Deschampsia cespitosa</i> with much <i>Rhytidiadelphus squarrosus</i> and <i>Hylocomium splendens</i> , plus <i>Galium saxatile</i> , <i>Achillea millefolium</i> , <i>Rumex acetosa</i> , <i>Pseudoscleropodium purum</i> ; local <i>Ajuga reptans</i> and <i>Ranunculus repens</i> indicating transition to marshy flushes.
46	315734	593926	<i>Juncus acutiflorus</i> dominates but with some mossy acid grassland areas and several old drains; <i>Carex</i> spp frequent, with <i>Ranunculus</i> spp (some <i>Ficaria verna</i> showing).
47	315695	593833	Short grazed flush, but quite diverse with <i>Carex</i> spp and <i>Calliergonella cuspidata</i> ; dissolves below into the grassland
48	316119	592913	Very steep bank with below a narrow band of mature ash plus oak, hazel and hawthorn with some ferns but mostly a grazed grassland ground cover; some acid grass in open (rare heather and blaeberry) but much bracken above (and upper slopes further above drenched with slurry).
49	316030	592440	Scrubby woodland covering east side of burn with much ash and hazel, over bracken and grass, but some woodland elements visible: <i>Stellaria holostea</i> , <i>Primula vulgaris</i> , <i>Potentilla sterilis</i> , <i>Chrysosplenium oppositifolium</i> and mosses include much <i>Eurhynchium striatum</i> and <i>Rhytidiadelphus triquetrus</i> . Roadside lined by dense scrub on both sides.
50	316126	592343	Burn with woodland parallel road; mature beech (heavy shading) dominates the western boundary, but elsewhere ash frequent (quite scrubby though, with much young beech); ground flora seems impoverished: <i>Deschampsia cespitosa</i> and <i>Rubus fruticosus</i> frequent, local <i>Polystichum aculeatum</i> to rocks, and several introduced plants including extensive, dense carpets of <i>Lamiasstrum argentatum</i> .
51	316214	592435	Very steep bank with relic trees (mature ash, hawthorn) but heavily grazed mossy grass forming ground flora; grassland less improved on slopes and to the leveller burn sides.
52	316416	592720	Heavily drained mire with much <i>Juncus acutiflorus</i> and mossy acid grassland associates; adjacent western area (fenced off) more grassy and drier, and presumably past enriched but appearing similar.
53	319238	594145	Mosaic of new woodland, scrub, acid grass, bracken and marshy flushes; south side with steep acidic grassland embankment (plus scrub, bracken and heather). All a rather complex area difficult to map, or code.
54	319317	594129	Large patches of marsh between (and under) trees with much <i>Filipendula ulmaria</i> plus some <i>Valeriana officinalis</i> , <i>Ficaria verna</i> , <i>Equisetum fluviatile</i> and <i>Rumex sanguineus</i> .

55	319444	594100	Valley about burn with much new broad-leaf tree planting and some relic shrubs, tending to coalesce (ash, rowan, willow, hawthorn and hazel); rather complicated mosaic with patches of drier acid grassland (some wet with <i>Deschampsia cespitosa</i> ), bracken and also large wet flushes ( <i>Juncus acutiflorus</i> and <i>Filipendula ulmaria</i> ).
56	319688	593995	Shallow pond with much open water (some <i>Potamogeton natans</i> ) with large marginal <i>Typha latifolia</i> swamp zones, with <i>Eleocharis palustris</i> to the outer edges; other species noted include <i>Ranunculus flammula</i> , <i>Myosotis scorpioides</i> , <i>Agrostis stolonifera</i> , <i>Veronica beccabunga</i> and <i>Callitriche stagnalis</i> .
57	319829	593943	Broad short grassy glade, with a more neutral appearance with frequent <i>Deschampsia cespitosa</i> plus local <i>Achillea millefolium</i> , <i>Lathyrus pratensis</i> and <i>Rhinanthus minor</i> .
58	319843	593700	Three prominent tussocks of <i>Carex paniculata</i> in extensive low-lying mire: <i>Juncus acutiflorus</i> dominated with <i>Filipendula ulmaria</i> , <i>Deschampsia cespitosa</i> , <i>Equisetum fluviatile</i> and <i>Carex rostrata</i> .
59	319442	593310	Marshy area (with <i>Juncus effusus</i> but to west <i>J. acutiflorus</i> dominated); associates include <i>Ranunculus repens</i> , various mosses and occasional <i>Angelica sylvestris</i> .

## Appendix 8.10 - Plant Species Lists

Scientific name	Common Name
<i>Achillea ptarmica</i>	Sneezewort
<i>Agrostis canina</i>	Velvet Bent
<i>Agrostis capillaris</i>	Common Bent
<i>Agrostis stolonifera</i>	Creeping Bent
<i>Agrostis vinealis</i>	Brown Bent
<i>Ajuga reptans</i>	Bugle
<i>Alchemilla filicaulis subsp. vestita</i>	Common Lady's mantle
<i>Alchemilla glabra</i>	Smooth Lady's-mantle
<i>Anemone nemorosa</i>	Wood Anemone
<i>Angelica sylvestris</i>	Wild Angelica
<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
<i>Arrhenatherum elatius</i>	False Oat-Grass
<i>Athyrium filix-femina</i>	Lady-fern
<i>Avenula pubescens</i>	Downy Oat-grass
<i>Bellis perennis</i>	Daisy
<i>Betula pubescens</i>	Downy Birch
<i>Blechnum spicant</i>	Hard-fern
<i>Briza media</i>	Quaking-grass
<i>Calluna vulgaris</i>	Heather
<i>Caltha palustris</i>	Marsh-marigold
<i>Campanula rotundifolia</i>	Harebell
<i>Cardamine flexuosa</i>	Wavy Bitter-cress
<i>Cardamine pratensis</i>	Cuckooflower
<i>Carex acutiformis</i>	Lesser Pond-sedge
<i>Carex bigelowii</i>	Stiff Sedge
<i>Carex binervis</i>	Green-ribbed Sedge
<i>Carex caryophyllea</i>	Spring-sedge
<i>Carex demissa</i>	Common Yellow-sedge
<i>Carex dioica</i>	Dioecious Sedge
<i>Carex echinata</i>	Star Sedge
<i>Carex flacca</i>	Glaucous Sedge
<i>Carex hostiana</i>	Tawny Sedge
<i>Carex laevigata</i>	Smooth-stalked Sedge
<i>Carex lasiocarpa</i>	Slender Sedge
<i>Carex leporina</i>	Oval Sedge
<i>Carex nigra</i>	Common Sedge
<i>Carex panicea</i>	Carnation Sedge
<i>Carex pilulifera</i>	Pill Sedge
<i>Carex pulicaris</i>	Flea Sedge
<i>Carex rostrata</i>	Bottle Sedge
<i>Ceratocarpus claviculata</i>	Climbing Corydalis
<i>Chamerion angustifolium</i>	Rosebay Willowherb
<i>Chrysosplenium oppositifolium</i>	Opposite-leaved Golden-saxifrage
<i>Cirsium arvense</i>	Creeping Thistle
<i>Cirsium heterophyllum</i>	Melancholy Thistle
<i>Cirsium palustre</i>	Marsh Thistle
<i>Cirsium vulgare</i>	Spear Thistle
<i>Cochlearia officinalis sens. lat.</i>	N/A
<i>Comarum palustre</i>	Marsh Cinquefoil

<i>Conopodium majus</i>	Pignut
<i>Corylus avellana</i>	Hazel
<i>Crataegus monogyna</i>	Hawthorn
<i>Crepis paludosa</i>	Marsh Hawk's-beard
<i>Cryptogramma crispa</i>	Parsley Fern
<i>Cynosurus cristatus</i>	Crested Dog's-tail
<i>Dactylorhiza maculata</i>	Heath Spotted-orchid
<i>Danthonia decumbens</i>	Heath-grass
<i>Deschampsia cespitosa</i>	Tufted Hair-grass
<i>Deschampsia flexuosa</i>	Wavy Hair-grass
<i>Digitalis purpurea</i>	Foxglove
<i>Drosera rotundifolia</i>	Round-leaved Sundew
<i>Dryopteris affinis agg.</i>	Scaly Male-fern
<i>Dryopteris carthusiana</i>	Narrow Buckler-Fern
<i>Dryopteris dilatata</i>	Broad Buckler-fern
<i>Dryopteris filix-mas</i>	Male-fern
<i>Dryopteris oreades</i>	Mountain Male-fern
<i>Empetrum nigrum</i>	Crowberry
<i>Epilobium brunnescens</i>	New Zealand Willowherb
<i>Epilobium obscurum</i>	Short-fruited Willowherb
<i>Epilobium palustre</i>	Marsh Willowherb
<i>Equisetum arvense</i>	Field Horsetail
<i>Equisetum fluviatile</i>	Water Horsetail
<i>Equisetum palustre</i>	Marsh Horsetail
<i>Equisetum sylvaticum</i>	Wood Horsetail
<i>Erica cinerea</i>	Bell Heather
<i>Erica tetralix</i>	Cross-leaved Heath
<i>Eriophorum angustifolium</i>	Common Cottongrass
<i>Eriophorum vaginatum</i>	Hare's-tail Cottongrass
<i>Festuca ovina</i>	Sheep's-fescue
<i>Festuca rubra agg.</i>	Red Fescue
<i>Ficaria verna</i>	Lesser Celandine
<i>Filipendula ulmaria</i>	Meadowsweet
<i>Fraxinus excelsior</i>	Ash
<i>Galium palustre</i>	Marsh-bedstraw
<i>Galium saxatile</i>	Heath Bedstraw
<i>Galium sternerii</i>	Limestone Bedstraw
<i>Galium uliginosum</i>	Fen Bedstraw
<i>Galium verum</i>	Lady's Bedstraw
<i>Geum rivale</i>	Water Avens
<i>Glyceria fluitans</i>	Floating Sweet-grass
<i>Hieracium vulgatum</i>	Common Hawkweed
<i>Holcus lanatus</i>	Yorkshire-fog
<i>Holcus mollis</i>	Creeping Soft-grass
<i>Hyacinthoides non-scripta</i>	Bluebell
<i>Hypericum humifusum</i>	Trailing St John's-wort
<i>Hypericum pulchrum</i>	Slender St John's-wort
<i>Hypericum tetrapterum</i>	Square-stalked St John's-wort
<i>Hypochaeris radicata</i>	Cat's-ear
<i>Juncus acutiflorus</i>	Sharp-flowered Rush
<i>Juncus articulatus</i>	Jointed Rush
<i>Juncus bulbosus</i>	Bulbous Rush
<i>Juncus conglomeratus</i>	Compact Rush

<i>Juncus effusus</i>	Soft-rush
<i>Juncus squarrosus</i>	Heath Rush
<i>Lathyrus linifolius</i>	Bitter-vetch
<i>Lathyrus pratensis</i>	Meadow Vetchling
<i>Linum catharticum</i>	Fairy Flax
<i>Lonicera periclymenum</i>	Honeysuckle
<i>Luzula campestris</i>	Field Wood-rush
<i>Luzula multiflora</i>	Heath Wood-rush
<i>Luzula pilosa</i>	Hairy Wood-rush
<i>Luzula sylvatica</i>	Great Wood-rush
<i>Lycopodium clavatum</i>	Stag's-horn Clubmoss
<i>Lysimachia nemorum</i>	Yellow Pimpernel
<i>Melampyrum pratense</i>	Common Cow-wheat
<i>Menyanthes trifoliata</i>	Bogbean
<i>Molinia caerulea</i>	Purple Moor-grass
<i>Montia fontana</i>	Blinks
<i>Myosotis secunda</i>	Creeping Forget-me-not
<i>Nardus stricta</i>	Mat-grass
<i>Narthecium ossifragum</i>	Bog Asphodel
<i>Neottia cordata</i>	Lesser Twayblade
<i>Oreopteris limbosperma</i>	Lemon-scented Fern
<i>Oxalis acetosella</i>	Wood-sorrel
<i>Pedicularis sylvatica</i>	Lousewort
<i>Picea sitchensis</i>	Sitka Spruce
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed
<i>Pimpinella saxifraga</i>	Burnet-saxifrage
<i>Pinguicula vulgaris</i>	Common Butterwort
<i>Pinus sylvestris</i>	Scots Pine
<i>Plantago lanceolata</i>	Ribwort Plantain
<i>Poa annua</i>	Annual Meadow-grass
<i>Poa humilis</i>	Spreading Meadow-grass
<i>Polygala serpyllifolia</i>	Heath Milkwort
<i>Potentilla erecta</i>	Tormentil
<i>Potentilla sterilis</i>	Barren Strawberry
<i>Primula vulgaris</i>	Primrose
<i>Prunella vulgaris</i>	Selfheal
<i>Pteridium aquilinum</i>	Bracken
<i>Ranunculus acris</i>	Meadow Buttercup
<i>Ranunculus flammula</i>	Lesser Spearwort
<i>Ranunculus repens</i>	Creeping Buttercup
<i>Rubus chamaemorus</i>	Cloudberry
<i>Rubus saxatilis</i>	Stone Bramble
<i>Rumex acetosa</i>	Common Sorrel
<i>Rumex obtusifolius</i>	Broad-leaved Dock
<i>Sagina procumbens</i>	Procumbent Pearlwort
<i>Sagina subulata</i>	Heath Pearlwort
<i>Salix aurita</i>	Eared Willow
<i>Salix caprea</i>	Goat Willow
<i>Salix cinerea</i>	Grey Willow
<i>Saxifraga stellaris</i>	Starry Saxifrage
<i>Scorzonerooides autumnalis</i>	Autumn Hawkbit
<i>Selaginella selaginoides</i>	Lesser Clubmoss
<i>Sorbus aucuparia</i>	Rowan

<i>Stellaria alsine</i>	Bog Stitchwort
<i>Stellaria holostea</i>	Greater Stitchwort
<i>Succisa pratensis</i>	Devil's-bit Scabious
<i>Taraxacum agg.</i>	Dandelion
<i>Teucrium scorodonia</i>	Wood Sage
<i>Thymus polytrichus</i>	Wild Thyme
<i>Trichophorum germanicum</i>	Deergrass
<i>Trifolium repens</i>	White Clover
<i>Tussilago farfara</i>	Colt's-foot
<i>Urtica dioica</i>	Common Nettle
<i>Vaccinium myrtillus</i>	Bilberry
<i>Vaccinium oxycoccos</i>	Cranberry
<i>Vaccinium vitis-idaea</i>	Cowberry
<i>Valeriana dioica</i>	Marsh Valerian
<i>Valeriana officinalis</i>	Common Valerian
<i>Veronica chamaedrys</i>	Germander Speedwell
<i>Veronica officinalis</i>	Heath Speedwell
<i>Viola lutea</i>	Mountain Pansy
<i>Viola palustris</i>	Marsh Violet
<i>Viola riviniana</i>	Common Dog-violet

#### Bryophytes

<i>Andreaea rupestris</i>
<i>Aneura pinguis</i>
<i>Anthelia julacea</i>
<i>Aulacomnium palustre</i>
<i>Barbilophozia floerkei</i>
<i>Brachythecium plumulosum</i>
<i>Brachythecium rivulare</i>
<i>Breutelia chrysocoma</i>
<i>Bryum pseudotriquetrum s.l.</i>
<i>Calliergon cordifolium</i>
<i>Calliergon sarmentosum</i>
<i>Calliergon stramineum</i>
<i>Calliergonella cuspidata</i>
<i>Calyptogeia muelleriana</i>
<i>Campylium stellatum s.l.</i>
<i>Campylopus atrovirens</i>
<i>Campylopus flexuosus</i>
<i>Campylopus introflexus</i>
<i>Cephalozia bicuspidata</i>
<i>Chiloscyphus polyanthos s.l.</i>
<i>Climacium dendroides</i>
<i>Cratoneuron filicinum</i>
<i>Ctenidium molluscum</i>
<i>Dichodontium palustre</i>
<i>Dicranum scoparium</i>



<i>Diplophyllum albicans</i>
<i>Drepanocladus revolvens</i>
<i>Eurhynchium praelongum</i>
<i>Fontinalis antipyretica</i>
<i>Fontinalis squamosa</i>
<i>Gymnomitrium obtusum</i>
<i>Hygrohypnum ochraceum</i>
<i>Hylocomium splendens</i>
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>
<i>Hypnum jutlandicum</i>
<i>Jungermannia exsertifolia</i>
<i>Lophocolea bidentata</i>
<i>Lophozia ventricosa</i>
<i>Mylia anomala</i>
<i>Mylia taylorii</i>
<i>Odontoschisma sphagni</i>
<i>Palustriella commutata</i> s.l.
<i>Pellia endiviifolia</i>
<i>Philonotis fontana</i>
<i>Plagiomnium undulatum</i>
<i>Plagiothecium undulatum</i>
<i>Platyhypnidium riparioides</i>
<i>Pleurozium schreberi</i>
<i>Pogonatum aloides</i>
<i>Pogonatum urnigerum</i>
<i>Polytrichum commune</i>
<i>Polytrichum juniperinum</i>
<i>Polytrichum piliferum</i>
<i>Polytrichum strictum</i>
<i>Pseudoscleropodium purum</i>
<i>Ptilidium ciliare</i>
<i>Racomitrium aciculare</i>
<i>Racomitrium fasciculare</i>
<i>Racomitrium heterostichum</i> s.l.
<i>Racomitrium lanuginosum</i>
<i>Rhytidiadelphus loreus</i>
<i>Rhytidiadelphus squarrosus</i>
<i>Rhytidiadelphus triquetrus</i>
<i>Scapania undulata</i>
<i>Scleropodium purum</i>
<i>Scorpidium scorpioides</i>
<i>Sphagnum angustifolium</i>
<i>Sphagnum capillifolium</i> s.l.
<i>Sphagnum capillifolium</i> subsp. <i>rubellum</i>
<i>Sphagnum contortum</i>
<i>Sphagnum cuspidatum</i>
<i>Sphagnum denticulatum</i>
<i>Sphagnum fallax</i>
<i>Sphagnum fimbriatum</i>
<i>Sphagnum girgensohnii</i>

<i>Sphagnum magellanicum</i>
<i>Sphagnum palustre</i>
<i>Sphagnum papillosum</i>
<i>Sphagnum russowii</i>
<i>Sphagnum squarrosum</i>
<i>Sphagnum subnitens</i>
<i>Sphagnum tenellum</i>
<i>Sphagnum teres</i>
<i>Thuidium tamariscinum</i>
<i>Warnstorfia exannulata</i>
<i>Warnstorfia fluitans</i>

#### Lichens

<i>Cetraria islandica</i>
<i>Cladonia impexa</i>
<i>Cladonia arbuscula</i>
<i>Cladonia rangiferina</i>
<i>Cladonia uncialis</i>
<i>Cladonia floerkeana</i>
<i>Sphaerophorus</i> spp.

**Appendix 8.11 – Results from Bat Activity Surveys**

Transect	Date	Species	Location	Activity
<b>Gillesbie</b>				
1	15/05/2018	<i>Pipistrellus</i> <i>Pipistrellus pygmaeus</i>	NY 1601 9248 NY 1601 9248	Commuting Commuting
1	25/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> Unidentified pipistrelle Unidentified pipistrelle <i>Pipistrellus pygmaeus</i> x 4 Unidentified <i>Myotis</i> sp <i>Pipistrellus pygmaeus</i>	NY 15840 93430 NY 15840 93430 NY 15840 93430 NY 16509 94206 NY 16238 94506 NY 16238 94506 NY 15807 94435	Commuting Commuting Commuting Feeding Feeding Feeding Commuting
1	09/08/2018	<i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> Unidentified <i>Myotis</i> sp	NY 15753 93633 NY 15753 93633 NY 14145 94027 NY 16734 94151 NY 16803 44125 NY 17337 94005 NY 17077 94176	Feeding Feeding Commuting Commuting Feeding/Commuting Commuting Commuting
1	15/10/2018	<i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i>	NY 15789 93581 NY 15870 93601	Commuting Commuting
<b>2 Laverhay</b>				
2	14/05/2018	<i>Pipistrellus pipistrellus</i> Unidentified pipistrelle	NY 1477 9861 NY 1537 9669	Feeding Commuting
2	12/06/2018	<i>Nyctalus noctula</i> x 2 <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 8 <i>Pipistrellus pipistrellus</i> x 8 <i>Pipistrellus pygmaeus</i> x 16 Unidentified pipistrelle x 6	NY 14528 97561 NY 14849 97669 NY 15355 97054 NY 15459 97727 NY 15396 97183 NY 15124 98700 Records distributed along edge of Laverhay Forest until track/sheepfold from previous grid point	Commuting/feeding Commuting Commuting Commuting Commuting Feeding/Commuting/Social Feeding/Commuting/Social
2	09/08/2018	<i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 6 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 9 <i>Pipistrellus pygmaeus</i> x 2 Unidentified pipistrelle <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 6	NY 15260 98514 NY 15260 98514 NY 15135 98701 NY 15135 98701 NY 14962 98621 NY 14962 98621 NY 14962 98621 NY 14746 98608 NY 14538 98595	Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting
2	15/10/2018	No bats recorded		
<b>3 Dundoran</b>				
3	14/05/2018	Unidentified <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2	NY 13374 98642 NY 13348 97965 NY 13348 97965	Commuting Commuting Commuting

		<i>Pipistrellus pipistrellus</i> x 9 <i>Pipistrellus pygmaeus</i> x 16 Unidentified pipistrelle x 5 <i>Myotis</i> sp <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> x 10 <i>Pipistrellus pygmaeus</i> x 21 Unidentified pipistrelle x 7	NY 13253 97271 NY 13253 97271 NY 13253 97271 NY 13253 97271 NY 13164 96991 NY 13164 96991 Leithenhall Farm Leithenhall Farm Leithenhall Farm	Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting Feeding/Commuting Feeding/Commuting Feeding/Commuting/Social Feeding/Commuting/Social Feeding/Commuting/Social
3	12/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> x 5	NY 13331 97639 NY 13254 97275	Commuting Commuting
<b>4 Ruegill</b>				
4	17/05/2018	<i>Pipistrellus pipistrellus</i> <i>Myotis</i> sp <i>Pipistrellus pipistrellus</i>	NT 16601 01403 NT 16601 01403 NT 16920 00299	Feeding Feeding Commuting
4	04/06/2018	<i>Pipistrellus pygmaeus</i>	NY 17002 99928	Commuting
4	26/06/2018	<i>Pipistrellus pipistrellus</i>	NT 16710 00570	Commuting
4	25/07/2018	<i>Pipistrellus pipistrellus</i>	NT 16530 01091	Commuting
4	27/08/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 9	NT 15941 00828 NT 16530 01091	Commuting Feeding/Commuting
<b>5 Three Mullach</b>				
5	17/05/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i>	NY 17042 97223 NY 17042 97223 NY 16388 98530 NY 16671 98476	Feeding/Social Feeding/Social Feeding Commuting
5	04/06/2018	<i>Pipistrellus pygmaeus</i>	NY 16534 98659	Feeding
5	26/06/2018	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pygmaeus</i>	NY 16105 99074 NY 16124 99050 NY 16124 99049 NY 16157 99011 NY 16352 98552 NY 16567 98211 NY 16351 98108 NY 17032 97276 NY 17016 97326	Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting Commuting
5	27/08/2018	<i>Pipistrellus pipistrellus</i> x 4 <i>Pipistrellus pygmaeus</i> x 4 <i>Nyctalus noctula</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pipistrellus</i> x 2 <i>Pipistrellus pygmaeus</i> x 2 <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> x 3 <i>Pipistrellus pygmaeus</i> x 3 <i>Pipistrellus pipistrellus</i> x 10	NY 16289 98676 NY 16289 98676 NY 16289 98676 NY 16289 98676 NY 16350 98556 NY 16350 98556 NY 16350 98556 NY 16326 98931 NY 16326 98931 NY 16562 98655 NY 16601 98229 NY 16507 98282 NY 16507 98282 NY 16471 98363 NY 16471 98363 NY 16593 98054	Commuting Commuting Commuting Feeding/Commuting Commuting Commuting Commuting Commuting Commuting/social Commuting/social Commuting Commuting Commuting Commuting Commuting Commuting Commuting



## Appendix 8.12 – Results of Bat Records from Static Detectors

Date	Detector Number	Species	Number of Passes
<b>Cluster 1 Dundoran</b>			
30/05/2018 to 04/06/2018	1 (Dundoran)	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	6 10 32 3
	2 (Burnt Mound)	No bat activity	-
	3 (Broadfield Height)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	205 75 29
	4 (Craig Fell)	<i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	7 58 2 2
<b>Cluster 2 Gillesbie</b>			
Spring 05/06/2018 to 12/06/2018	1 (Gudewife's Hill)	No bat activity recorded	-
	2 (Sembletree Burn)	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	29 179 3912 16
	3 (Gillesbie Hill)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	54 67 47
	4 (VP1)	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i> <i>Plecotus auritus</i>	6 4 548 398 177 1
<b>Cluster 2 Gillesbie</b>			
Summer 25/07/18 to 01/08/18	1(Gudewife's)	<i>Unidentified Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	3 21 89 12
	2 (Sembletree Burn)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 39
	3	No bat activity	-
	4 (VP1)	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	3 27 55 49 22
<b>Cluster 2 Gillesbie</b>			
Autumn 02/09/2018 to 07/09/2018	1	No bat activity	-
	2	No bat activity	-

	3	No bat activity	-
	4	No bat activity	-
<b>Cluster 3 Ramshaw Rig</b>			
Spring 21/05/18 to 29/05/18	1 (Finniegill)	<i>Pipistrellus pipistrellus</i>	2
	2 (Rue Gill)	No bat activity	-
	3 (Dryfe valley)	No bat activity	-
	4 (R'Shaw Rig)	No bat activity	-
<b>Cluster 3 Ramshaw Rig</b>			
Summer 16/07/18 to 24/07/18	1 (Finniegill)	<i>Pipistrellus pipistrellus</i>	1
	2 (Rue Gill)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	217 2
	3 (Dryfe valley)	No bat activity	-
	4 (R'Shaw Rig)	<i>Unidentified Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i>	2 4 1
<b>Cluster 3 Ramshaw Rig</b>			
Autumn 03/10/18 to 15/10/18	1	No bat activity	-
	2	No bat activity	-
	3	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	6 7 1
	4	<i>Myotis sp</i>	3
<b>Cluster 4 Silton Forest</b>			
Spring 14/05/18 to 18/05/18	1 (LBKnowe)	No bat activity	-
	2 (Shed)	No bat activity	-
	3 (Bog relic)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 1
	4 (old VP6)	No bat activity	-
<b>Cluster 4 Silton Forest</b>			
Summer 13/06/2018 to 18/06/2018	1	<i>Myotis sp</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	2 66 5 3
	2	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	5 11
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	13 4 1
	4	<i>Pipistrellus pipistrellus</i>	5
<b>Cluster 4 Silton Forest</b>			
Summer 10/07/18 to 16/07/18	1	<i>Myotis sp</i> <i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i> <i>Plecotus auritus</i>	87 9 396 95 40 3



	2	<i>Nyctalus noctula</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	2 82 68 8
	3	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus sp (50kHz)</i>	20 153 1
	4	No bat activity	-
<b>Cluster 4 Silton Forest</b>			
2 Autumn 7/08/18 to 07/09/2018	1 (Shed)	<i>Myotis species</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	1 29 15
	2 (LBknowe)	<i>Myotis species</i> <i>Myotis natterii</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Plecotus auritus</i>	4 3 17 21 4 1
	3 (Bog relic)	<i>Myotis species</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	4 1 16 39
	4 (Old VP6)	No bat activity	-
<b>Cluster 5 South Loch Fell</b>			
Summer 2019 27/06/2019 to 06/07/2019	1 (Dun Moss)	<i>Pipistrellus pipistrellus</i>	4
	2 (S Loch Fell)	<i>Pipistrellus pipistrellus</i> <i>Pipistrellus pygmaeus</i>	89 17
<b>Cluster 5 South Loch Fell</b>			
Late summer 2019 16/07/2019 to 27/07/2019	1 (Dun Moss)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	4 6 1

	2 (S Loch Fell)	<i>Myotis species</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i>	1 3 3
<b>Cluster 6 Three Mullach Hill</b>			
Spring 2019 16/04/2019 to 26/04/2019	1	No bat activity	-
	2	No bat activity	-
	3	No bat activity	-
	4	No bat activity	-
<b>Cluster 6 Three Mullach Hill</b>			
Summer 2019 21/08/2019 to 31/08/2019	1( North T M Hill)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Plecotus auritus</i>	3 22 34 3
	2 (Track edge)	<i>Myotis species</i> <i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus sp (50kHz)</i>	3 4 303 447 25
	3 (South T M Hill)	<i>Nyctalus noctula</i> <i>Pipistrellus pygmaeus</i> <i>Pipistrellus pipistrellus</i> <i>Pipistrellus sp (50kHz)</i>	2 89 138 17
	4 (track edge west)	No bat activity	-
<b>Cluster 6 Three Mullach Hill</b>			
Autumn 2019 10/09/2019 to 20/09/2019	1	No bat activity	-
	2	No bat activity	-
	3	No bat activity	-
	4	No bat activity	-

**Appendix 8.13 – Total Number of Bat Passes per Month**

Key: Pip = pipistrelle species, Ppip = Common Pipistrelle, Ppyg = Soprano Pipistrelle, NYC = Noctule, MYO = Myotis species, BLE = Brown Long-eared

Detector and area of survey	May	June	July	August	September	October
<b>Dundoran</b>		30/05/18 to 04/06/18				
	-	378 (7 Nyc, 6 Myo, 365 Pip)	-	-	-	-
<b>Gillesbie</b>		05/06/2018 to 12/06/2018	25/07/18 to 01/08/18			
	-	5438 (1BLE, 4 Nyc, 35 Myo, 5398 Pip)	156 (6 Myo, 27 Nyc, 123 Pip)	-	0	-
<b>Ramshaw Rig</b>	21/05/18 to 29/05/18		16/07/18 to 24/07/18			03/10/18 to 15/10/18
	2 (Ppip)	-	227 (4 Nyc, 2 Myo, 221 Ppip, 2 Ppyg)	-	-	17 (9 Myo, 7 Ppip, 1 Ppyg)
<b>Silton Forest</b>	14/05/18 to 18/05/18	13/06/2018 to 18/06/2018	10/07/18 to 16/07/18		27/08/18 to 07/09/2018	
	2 (Pip)	115 (2 Myo, 113 Pip)	964 (87 Myo, 11 Nyc, 866 Pip)	-	155 (12 Myo, 18 Nyc, 125 Pip)	-
<b>South Loch Fell (2019)</b>		27/06/2019 to 06/07/2019	16/07/2019 to 27/07/2019			
	-	110 (Pip)	18 (4 Nyc, 1 Myo, 13 (Pip))	-	-	-
<b>Three Mullach Hill (2019)</b>	16/04/2019 to 26/04/2019			27/08/2019 to 31/08/2019	10/09/2019 to 20/09/2019	
	0	-	-	1090 (9 Nyc, 3 BLE, 3 Myo, 1075 Pip)	0	-

**Appendix 8.14 – Summary of Otter Evidence (non-sensitive data)**

Evidence	Number on Map	Grid Reference	Location
Recent print in mud on track above culvert	1	NY 10070 98575	On track out to old Nether Murthat quarry
Recent spraint on rock at inside of confluence	2	NY 10136 98541	Near railway line west of old Nether Murthat quarry
Fresh spraint on grassy mound, right bank of burn	3	NY 10189 98421	Along Dead Burn near railway line west of Nether Murthat quarry
One recent spraint	4	NY 10627 98297	On rock on left bank of Dead Burn near confluence with R. Annan
Spraint	5	NY 15595 95655	On bank of Sembletree Burn
Spraint	6	NT 16974 00363	On bank of Dryfe Water north of Dryfehead Bothy
Otter spraint and Badger dung on same on same bit of moss	7	NT 16968 00307	On bank of Dryfe Water north of Dryfehead Bothy
Otter slide	8	NT 16984 00301	On bank of Dryfe Water north of Dryfehead Bothy
1 recent spraint	9	NY 17050 99866	At crossing of Dryfe Water south of Dryfehead Bothy
2 recent spraints and 1 fresh spraint	10	NY 17154 99765	On western bank of Dryfe Water south of Dryfehead Bothy
1 fresh 2 recent	11	NY 17157 99761	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint	12	NY 17201 99675	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint and 1 fresh spraint	13	NY 17188 99567	On western bank of Dryfe Water south of Dryfehead Bothy
1 recent spraint	14	NY 17227 99563	On western bank of Dryfe Water south of Dryfehead Bothy
Spraint	15	NY 17279 99439	On western bank of Dryfe Water south of Dryfehead Bothy
Otter slide	16	NY 17187 96713	On western bank of Dryfe Water south of Dryfehead Bothy
1 fresh spraint and four old spraints	17	NY 17196 96710	On eastern bank of Dryfe Water south of Dryfehead Bothy
Spraint	18	NY 17785 96415	At edge of plantation on lower eastern slopes of Macmaw Hill
1 recent spraint and 1 fresh spraint	19	NY 17336 99320	On eastern bank of Dryfe Water south of Dryfehead Bothy
Prints	20	NY 18588 94976	On eastern bank of Cocklaw Burn
2 old spraints and 1 fresh spraint	21	NY 18824 95449	On eastern bank of Waterhead Burn below culvert
1 fresh spraint	22	NY 19640 95501	On western bank of Murthat Burn east of Little Brown Knowe
2 recent spraints	23	NY 19743 94036	On bank of Murthat Burn where it meets forestry track

**Appendix 8.15 – Summary of Badger Evidence (non-sensitive data)**

Location	Feature
NY 15088 98622	Dung and foraging signs
NY 14750 98569	Foraging signs
NY 14638 98635	Path
NT 12446 00509	Latrine
NY 18248 99018	Latrine
NY 18664 94751	Latrine
NY 18687 94751	Dung
NY 18402 95463	Dung
NY 18105 95080	Dung
NY 17187 95910	Latrine
NY 18071 94848	Foraging signs
NY 18077 94780	Latrine
NY 17966 94971	Latrine
NY 16748 98744	Dung
NT 17077 00036	Foraging signs
NT 17349 00327	Foraging signs
NT 17420 00502	Dung
NT 17191 00682	Dung
NT 17151 00789	Dung
NT 17021 00743	Dung
NT 17297 00594	Dung
NT 17361 00987	Dung
NT 17448 01409	Dung
NT 17440 01158	Foraging signs
NT 17491 01012	Dung and foraging signs
NY 15566 99596	Dung
NY 15373 99188	Dung
NY 18717 96318	Dung
NY 18823 96252	Dung
NY 18810 96109	Dung
NY 20065 95963	Dung
NY 19523 95742	Dung
NY 19576 95627	Dung
NY 19390 95667	Dung
NY 19337 95614	Dung
NY 19714 94901	Dung
NY 19685 94771	Dung
NT 16979 00336	Dung
NT 17034 00127	Path, at either side of watercourse
NY 17341 99165	Dung

NY 17315 99367	Dung
NY 17262 99424	Foraging signs
NY 17325 98805	Dung
NT 17044 00117	Path
NY 17078 99882	Dung and path
NT 17020 00221	Dung and path
NT 16974 00286	Signs of aggressive encounter between Badger and Otter
NY 18789 94386	Latrine and foraging signs
NY 19387 93051	Path and foraging signs
NY 18948 93548	Foraging signs
NY 18783 93525	Foraging signs
NY 18567 93936	Foraging signs and path
NY 18248 98916	Latrine and path leading south
NT 13506 00157	Foraging signs
NT 16857 04850	Latrine
NT 16138 01098	Dung
NY 12858 98783	Foraging signs
NY 12836 99008	Dung and path
NY 12836 99136	Foraging signs
NY 12927 99330	Foraging signs
NY 12934 99458	Foraging signs
NY 13107 99481	Foraging signs and dung
NY 13277 99371	Foraging signs and dung
NT 17182 04938	Dung and path
NT 17337 05353	Latrine with two well-used pits beside path
NY 16924 94430	Foraging signs
NY 18444 95581	Lots of foraging signs
NY 18860 96183	Foraging signs
NY 19011 96000	Foraging signs, including dug-out bee nest
NY 16347 94584	Lots of foraging signs
NY 16386 94554	Latrine with one pit and fresh dung
NT 11748 00400	Latrine with seven well-used pits
NY 11119 99338	Print in mud beside field gate
NY 13809 99805	Path leading out of wood onto moor
NY 13782 99949	Path leading out of wood onto moor
NT 16419 00428	Path
NY 13524 99180	Foraging signs
NY 18834 94516	Extensive foraging recorded here throughout 2 years of survey



**Appendix 8.16 – Common Lizard Sightings**

Grid Reference
NT 14902 02601
NY 16233 85637

**Appendix 8.17 – Results of Electrofishing Surveys****Dryfe Water Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
De7	52.6	0	28.4	6.9
De0.5	0	0	0	0
DeSl1	15.5	0	99.4	6.2
DeCe1	16.2	0	39.2	10.8
De3	13	0	56.1	6.7
De4	3.3	0	77.2	5.8
De8	19.8	2.6	25.8	6.0
De9	14.9	1.5	55.2	6.0

**Wamphray Water Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Wy0.5	0.0	0.0	9.6	7.9
Wy1	0.0	0.0	3.8	1.0
Wy2	0.0	0.0	1.9	4.0
Wy3	102.6	3.6	30.3	7.0
Wy4	243.5	7.0	49.7	0.0
Wy5	133.8	1.0	12.4	0.0
Wy6	0.0	0.0	3.0	3.0
Wy 7	0.0	0.0	1.2	3.0
Wy8	205.0	5.9	35.3	1.0
Wy9	337.4	1.5	82.1	0.0

## Appendix 8.18 – Important Ecological Features (IEFs) – Habitats

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDTE Sensitivity
A1.1.1 Semi-natural broad-leaved woodland	W9 <i>Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis</i> woodland W7 <i>Alnus glutinosa-Fraxinus excelsior-Lysimachia nemorum</i> woodland W11 <i>Quercus petraea-Betula pubescens-Oxalis acetosella</i> woodland	<b>National (Dryfe Water SSSI)/local</b> Part of the habitat is protected by SSSI designation.  UK BAP priority habitats: 'Upland oak wood, upland birch woods' and 'Upland mixed ashwoods'.  D&G LBAP priority habitat.	LOW Semi-natural cleuch woodland in general lends significant diversity to the otherwise open habitats of typical open upland areas. There are several small fragments within the site along the margins of the watercourses. In view of the small size of the habitat, it has only local value. Dryfe Water SSSI, an example of 'Upland mixed ashwood', must be considered separately to have national value as it has been chosen as one of the best examples of this habitat type.	Low (W9, W11)  High (W7)
A1.1.2 Broad-leaved plantation woodland	-	<b>Very local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Broadleaved and Mixed Plantations' under the heading 'Highly modified habitats'	LOW The habitat as present within the site has only been very recently established and therefore has little or no woodland plants in the field layer. The new plantation areas provide some additional ecological diversity (foraging and nesting habitat for birds and shelter for small mammals and invertebrates). This habitat is of local value.	-
A1.2.2 Coniferous plantation	-	<b>Local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Coniferous Woodland' under the heading 'Highly modified habitats'	LOW This is by far the largest habitat type in the site, covering around 3080ha when combined with A4.2 below. It is lacking in botanical diversity since most of the woodland has no woodland ground flora. It supports a suite of common bird species and provides breeding habitat, shelter for mammals and foraging edge for bats. It supports a small Red Squirrel and Pine Marten population. Sheltered grassland areas along track edges and marshy grassland rides within the forest support numbers of butterflies such as Common Blue, Scotch Argus and Small Pearl-bordered Fritillary. The habitat has very recently supported one breeding pair of Goshawk up until the felling of the trees at the nest site. Since its value to that important species is extremely variable, connected to the cycle of suitable stands of mature trees, this habitat is of local value.	-
A1.3.2 Mixed plantation	-	<b>Very local</b> Dumfries and Galloway Local Biodiversity Action Plan discusses the conservation potential of 'Broadleaved and Mixed Plantations' under the heading 'Highly modified habitats'	LOW The habitat as present within the site has only been very recently established and therefore has little or no woodland plants in the field layer. The new mixed plantation areas provide additional ecological diversity (foraging habitat for birds and shelter for small mammals and invertebrates).	-
A2 Scrub	W1 <i>Salix cinerea-Galium palustre</i> woodland 'WSx' scrub  W21 <i>Crataegus monogyna-Hedera helix</i> scrub	<b>Local</b> W1 <i>Salix cinerea-Galium palustre</i> woodland is referable to  UK BAP priority habitat 'Wet woodland' District/County  D&G LBAP priority habitat 'Scrub Woods'	LOW This habitat is scattered throughout the site on the lowest slopes and riparian edge of the watercourses, and small un-mappable stands are found along several stretches of forestry access tracks in the east of the site. At these various locations it lends a small but useful contribution to the ecological mosaic. This habitat is of local value.	Low (W21, 'WSx')  Moderate (W1)
A4.2 Recently-felled coniferous woodland	-	<b>Very local</b> No conservation status for this habitat	LOW This habitat is generally rather poor floristically. There can be a temporary establishment of species such as foxglove and rosebay willowherb. Some ecological niches may be temporarily created for species such as pied wagtail, nesting in crevices in rock piles or overhangs. Clear fell can form part of habitat mosaics supporting nightjar, but this species has not established itself at the site.	-

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDE Sensitivity
B1.1 Unimproved acid grassland	U4 <i>Festuca ovina-Agrostis capillaris-Galium saxatile</i> grassland  U5 <i>Nardus stricta-Galium saxatile</i> grassland  U6 <i>Juncus squarrosus-Festuca ovina</i> grassland	<b>Local</b> D&G LBAP priority habitat	LOW Acid grassland is the most extensive open habitat within the study area for the wind farm and is common and widespread in the uplands of Dumfries and Galloway. The habitat is generally species-poor due to heavy grazing over a long period. The habitat contributes to the open upland habitat mosaic. The grassland directly supports ground-nesting birds such as skylark and meadow pipit. This habitat has local value.	Low
B5 Marsh/marshy grassland	M23 <i>Juncus effusus/acutiflorus-Galium palustre rush-pasture</i>  M25 <i>Molinia caerulea-Potentilla erecta mire</i>	<b>Local</b> UK BAP priority habitat Upland flushes, fens and swamps.  Regarded as a habitat of National importance but Local at this site.	LOW Marshy grassland is the second largest open habitat after acid grassland. Most of the habitat that is located on ground accessible to grazing animals is rather species-poor. There are some examples that are more species-rich, such as along the watercourses in the eastern plantations. The habitat contributes to the ecological mosaic and supports the Scotch Argus butterfly at several locations within the survey area.	Low (M25)  Moderate or high at some locations (M23)
C1 Bracken	U20 <i>Pteridium aquilinum-Galium saxatile</i> community	<b>Local</b> No conservation status for this habitat	LOW Bracken is widespread on the lower slopes of the hills, most extensively in the western part of the site. It is assessed to be of local value, providing shelter for mammals and invertebrates and, in places, nesting habitat for significant bird species such as stonechat and whinchat.	Low
C3.2 Non-ruderal tall herb and fern	U16 <i>Luzula sylvatica-Vaccinium myrtillus</i> tall herb community  U19 <i>Oreopteris limbosperma-Blechnum spicant</i> community	<b>Very local</b> No conservation status for this habitat	LOW Stands of these tall herb and fern habitat types are scarce within the site. Where they occur, they are not extensive, but do provide some additional diversity to the ecological mosaic, providing shelter for mammals, invertebrates and, in some cases (U19), shade for woodland plants.	Low
D1.1 Dry dwarf shrub heath	H10 <i>Calluna vulgaris-Erica cinerea</i> heath  H12 <i>Calluna vulgaris-Vaccinium myrtillus</i> heath  H18 <i>Vaccinium myrtillus-Deschampsia flexuosa</i> heath	<b>Regional</b> Annex I Habitat European Dry Heaths  UK BAP Upland heaths  D&G LBAP priority habitat D 1.1/D2/E1.6.1/E1.7/E1.8, but to much lesser effect, B1.1 acid grassland in the NW and NE is the core of the golden eagle habitat.	MEDIUM Dry heath is one of the larger open habitats on the site (occupying c303ha) and also forms a component of D5 Dry heath/acid grassland mosaic (c51ha). Taken together with the amount of E1.8 Dry modified bog dominated by heather (there is much habitat at this site that is intermediate between the two) it accounts for a large proportion of the less-grazed north-western and north-eastern parts of the site. The habitat is not typical of the best quality heaths and is rather species-poor, but it has particular significance at this site as an important part of golden eagle foraging habitat.	Low
D2 Wet dwarf shrub heath	M15 <i>Trichophorum cespitosum-Erica tetralix</i> wet heath	<b>County/District</b> Annex I North Atlantic wet heaths with <i>Erica tetralix</i>  UK BAP upland heaths  D&G LBAP priority habitat  Recognised as being of International value but of <b>county or district</b> value at this site	LOW Wet heath (c150ha) occupies a much smaller proportion of the site than the related bog habitats and the extensive dry heath. It occurs to the margins of bog habitats on damp slopes on thinner peat and forms a component in several areas of wet heath/acid grassland mosaic (D6 c33ha) where heather has been reduced by grazing over time. It adds to the important mosaic of open upland habitats at the site as a component of the golden eagle foraging habitat.	Low



Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDE Sensitivity
E1.6.1 Blanket bog	M2 <i>Sphagnum cuspidatum/fallax bog pool community</i>  M3 <i>Eriophorum angustifolium bog pool community</i>  M17 <i>Trichophorum germanicum-Eriophorum vaginatum mire</i>  M18 <i>Erica tetralix-Sphagnum papillosum mire</i>  M19 <i>Calluna vulgaris-Eriophorum vaginatum mire</i>  M20 <i>Eriophorum vaginatum mire</i>	<b>County</b> Annex I Blanket bogs  UK BAP Blanket bog  D&G LBAP priority habitat  Recognised as being of International value but of <b>County</b> value at this site	<b>MEDIUM</b> Blanket bog rich in <i>Sphagnum</i> mosses accounts for a relatively small proportion of the open upland habitats (c90ha) compared to E1.8 Dry modified bog (see below). It is confined to small and fragmented sections scattered throughout the site at locations where the ground has escaped heavy grazing or drainage over time. The habitat is a significant component within the important mosaic of upland habitats within the study area and lends much ecological diversity.	Low
E1.7 Wet modified bog	M17 <i>Trichophorum germanicum-Eriophorum vaginatum mire</i>  M20 <i>Eriophorum vaginatum mire</i>  M25 <i>Molinia caerulea-Potentilla erecta mire</i>  (and transitional communities)	<b>County</b> International (Blanket bog)  UK BAP Blanket bog	<b>MEDIUM</b> Wet modified bog is not at all extensive within the site (c32ha) but lends some ecological diversity as part of an important suite of open upland habitats.	Low
E1.8 Dry modified bog	M20 <i>Eriophorum vaginatum mire</i>	<b>County</b> Annex I Blanket bogs  UK BAP Blanket bog	<b>MEDIUM</b> Dry modified bog (c313ha) is the most extensive open habitat after acid grassland in the windfarm survey area. Although this category represents the most degraded type of blanket bog on the site, it is still a vital component of the overall resource and would be capable of enhancement given suitable management.	Low
E2.1 Acid/neutral flush	M4 <i>Carex rostrata-Sphagnum fallax mire</i>  M6 <i>Carex echinata-Sphagnum fallax/denticulatum mire</i>	<b>Local</b>  National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	<b>LOW</b> This habitat is not diverse botanically, but it contributes to the ecological mosaic and supports invertebrates and upland birds particularly in winter months.	Moderate at some locations
E2.2 Basic flush	M10 <i>Carex dioica-Pinguicula vulgaris mire</i>	<b>Very local</b> National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	<b>LOW</b> There is only one small example of this habitat within the site. It is quite distinctive and rather uncommon in the uplands. It provides a little additional ecological diversity.	High
E2.3 Bryophyte-dominated spring	M37 <i>Palustriella commutatum-Festuca rubra spring</i>	<b>Very local</b>  National (UK BAP 'Upland flushes, fens and swamps') D&G LBAP priority habitat	Only a few small examples (too small to map) of this habitat were found within the study area. They lend some distinctive additional ecological diversity to the ecological mosaic.	High

Habitat Type	NVC Habitats	Nature Conservation Evaluation (Level of Ecological Value)	Site Value (Description)	GWDTE Sensitivity
F1 Swamp, marginal and inundation	S9 <i>Carex rostrata</i> swamp	<b>Very local</b> National (UK BAP 'Lowland fens' Upland flushes, fens and swamps') D&G LBAP priority habitat	LOW There is only one small area of swamp within the site which adds a little ecological variety to the surrounding agricultural land.	Low
G1 Standing water	-	<b>Very local/local</b> National (UK BAP, Oligotrophic lakes, ponds)	LOW There are only two small ponds within the site. They add a little ecological variety to the surrounding mires and grasslands. There is the large lagoon on the western approach route, on the west side of the Annan.	-
G2 Running water	-	<b>Regional</b> National (UK BAP, 'Rivers habitat') D&G LBAP priority habitat	MEDIUM The River Annan is a major river in the south west of Scotland and the burns in the site are important as corridors both within the site and leading to the outside of it. These features have regional value.	-
I1.1.1 Inland cliff	-	<b>Very local</b> UK BAP Inland Rock Outcrop and Scree Habitats D&G LBAP priority habitat	LOW This habitat is very limited in its extent within the study area, being confined to a small areas on Glengap Shank. It provides a very small additional ecological niche in the open upland habitat mosaic.	-
I1.2.1 Scree	-	<b>Local</b> UK BAP Inland Rock Outcrop and Scree Habitats D&G LBAP priority habitat	LOW This habitat is very limited in its extent within the study area, being confined to areas in the north-west of the study area, around Gallatae, Craig Fell, Glengap Head and the Glengap Burn valley. It lends a little diversity to the open upland habitat mosaic. It is often used for loafing by golden eagle.	-
J1.2 Amenity grassland	-	<b>Negligible</b> UK Broad Habitat: 'Improved grassland'	LOW A very small area of amenity grassland is present within the study area, where there are mown areas in the vicinity of the dwelling houses at Finniegill and at Dryfehead Bothy. This habitat is of negligible value to conservation.	-
J1.3 Ephemeral/short perennial	-	<b>Very local</b> UK Broad Habitats: 'Arable and horticulture' or 'Built-up areas and gardens'	LOW Only a small area of this habitat was found within the survey area. It provides a little additional ecological value.	-
J4 Bare ground	-	<b>Negligible</b> (No conservation status)	NEGLIGIBLE This habitat type has been used to represent access track area, hard-standing or disturbed areas – at the time of survey - such as feeding stations. It is of negligible value.	-

**Appendix 8.19 – Important Ecological Features (IEFs) – Species**

Species	Conservation Importance	Legal status	Nature Conservation Evaluation
Bats: Common pipistrelle Soprano pipistrelle Myotis sp Noctule Bat Brown Long-eared Bat	High (National)	Fully protected under the W & CA 1981 and the EU Habitats Directive (EPS)	Soprano Pipistrelle: UK BAP, Dumfries & Galloway LBAP Scottish Biodiversity List and EPS; Common Pipistrelle, Noctule, Brown Long-eared bat, and Whiskered Bat Myotis mystacinus: Dumfries & Galloway LBAP Scottish Biodiversity List and EPS
Otter	High (National)	Fully protected under the W & CA 1981 and the EU Habitats Directive (EPS)	UK BAP Dumfries & Galloway LBAP Scottish Biodiversity List
Common Lizard	High (National)	Protected against killing under the W & CA 1981	UK BAP
Migratory salmonids,	High (National)	Atlantic Salmon protected under Schedule 3 of the EU Habitats Directive (EPS)	UK BAP Dumfries and Galloway LBAP (apart from Trout) Scottish Biodiversity List
Badger	Medium (Regional)	Protection of Badgers Act 1992	Dumfries & Galloway LBAP Scottish Biodiversity List
Red Squirrel	Medium (Regional)	Red squirrels and their dreys receive full protection under Schedules 5 and 6 of the Wildlife and Countryside Act 1981 (as amended).	UK BAP Scottish Biodiversity List Dumfries & Galloway LBAP
Pine Marten	Low (Local)	Full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Schedule 3 of the EU Habitats Directive (EPS)	UK BAP Scottish Biodiversity List
Roe deer and Red Deer	Low (Local)	Protected under the Deer (Scotland) Act 1996	Red Deer listed as High Importance in Dumfries and Galloway LBAP associated with Grassland and Heathland habitats and both Red and Roe associated with woodland habitats. Scottish Biodiversity List
Large Heath	Low (Local)	Partially protected by Section 9, Parts 5(a) and 5(b) of the Wildlife and Countryside Act 1981 (as amended).	UK BAP Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats

Scotch Argus butterfly	Low (Local)	-	Listed as High Importance in Dumfries and Galloway LBAP associated with Purple Moor Grass and Rush Pastures habitats.
Small Heath butterfly	Low (Local)	-	UK BAP Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with Calcareous grassland habitats.
Small Pearl-bordered Fritillary	Low (Local)	-	UK BAP Priority Species Scottish Biodiversity List Local Priority Species in Dumfries and Galloway LBAP
Common Frog	Low (Local)	Protected by Section 9(5) of the Wildlife and Countryside Act 1981	Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats
Common Toad	Low (Local)	Protected by Section 9(5) of the Wildlife and Countryside Act 1981	UK BAP priority species Scottish Biodiversity List Listed as High Importance in Dumfries and Galloway LBAP associated with various habitats

**Appendix 8.20 – Dimensions used in Habitat Loss Calculations**

<b>Feature</b>	<b>Final Dimensions</b>	<b>Dimensions used for Habitat Loss</b>
Turbine Foundations	18 x 18	28 x 28
Access Track	5m running width	10 width (to include cabling)
Crane Hardstanding	1500m <sup>2</sup>	1925m <sup>2</sup>
Borrow-pits	1000m <sup>2</sup>	1000m <sup>2</sup>
Temporary construction/site storage compounds	Variable to suit design	As mapped in GIS
Junctions	Variable to suit design	As mapped in GIS

**Appendix 8.21 – Loss of Habitat Types**

Habitat Type	Extent of Habitat Present (ha)	Loss of Habitat (ha)	Percentage Loss (%)
A1.1.1 Semi-natural broad-leaved woodland	42.6	0.031059	0.07
A1.1.2 Broadleaved plantation woodland	75.4	0.000442	N/A
A1.2.2 Coniferous plantation	2374.1	43.14194	1.8
A1.3.2 Mixed plantation	15.8	0	N/A
A2.1 Scrub	16	0.030413	0.19
A4.2 Recently-felled coniferous woodland	706.7	15.44949	2.18
B1.1 Unimproved acid grassland	891.9	10.81521	1.2
B1.2 Semi-improved acid grassland	262	2.447603	0.93
B2.1 Unimproved neutral grassland	12.8	0.045151	0.35
B2.2 Semi-improved neutral grassland	18	0.381429	2.11
B4 Improved grassland	78.4	1.299541	1.65
B5 Marsh/marshy grassland	396	3.813413	0.96
B6 Poor semi-improved grassland	89	2.517106	2.83
C1 Bracken	130.3	0.490006	0.38
C3.1 Ruderal tall herb and fern	0.5	0	N/A
C3.2 Non-ruderal tall herb and fern	0.04	0	N/A
D1.1 Dry dwarf shrub heath	302.7	2.015631	0.66
D2 Wet dwarf shrub heath	150.1	3.13741	2.1
D5 Dry heath/acid grassland mosaic	51.2	0.532175	1.0
D6 Wet heath/acid grassland mosaic	32.9	0.606671	1.84
E1.6.1 Blanket bog	89.5	3.413799	3.81
E1.7 Wet modified bog	31.7	0.811312	2.56
E1.8 Dry modified bog	312.6	14.21992	4.55
E2.1 Acid/neutral flush	0.5	0	N/A
E2.2 Basic flush	<0.1	0	N/A
E2.3 Bryophyte-dominated spring	<0.1	0	N/A
F1 Swamp	0.2	0	N/A
G1 Standing water	0.7	0	N/A
G2 Running water	N/A	0	N/A
I1.1.1 Inland cliff	0.06	0	N/A
I1.2.1 Scree	2.2	0	N/A
J1.2 Amenity grassland	0.5	0	N/A
J1.3 Ephemeral/short perennial	0.6	0	1.3
J4 Bare ground	5.72	0.141072	2.47
	8572.8	105.3408 Total loss	1.23



**Appendix 8.22 – Developments within the Natural Heritage Zone**

Wind Farm	Number of turbines	Distance from Scoop Hill (km)
Operational/under construction		
Hopsrig	12	8
Minnygap	10	9
Ewehill and Extension	22	9.5
Harestanes	68	10
Minsca	16	12.5
Craig	4	14
Clyde	152	17
Dalswinton	15	20
Clyde Extension	57	20
Consented		
Crossdykes	15	7.5
Lion Hill	4	15.9
Solwaybank	15	16.2
Crookedstane Farm	4	18.8
Planning		
Loganhead	8	8
Earlshaugh	24	13
Faw Side	45	15
Whitelaw Brae	14	16

**Appendix 8.23 – Residual Effects**

Feature and Type of Disturbance	Significance without Mitigation	Proposed Mitigation/Enhancement	Residual Significance
<b>Designated Sites</b>	No impacts	No impacts	No impacts
<b>Habitats</b>	<p>Loss of blanket bog, wet modified bog and dry modified <b>low magnitude</b>, of <b>minor significance</b> and <b>permanent</b>.</p> <p>Loss of most habitats, <b>low</b> in <b>magnitude</b> and of <b>minor significance</b></p> <p>No direct loss of any <b>GWDTE</b></p> <p>During construction, many negative impacts will be negligible however some such as the drying of bog habitats and water pollution are considered to be negative, of <b>medium magnitude</b>, <b>permanent</b> and of <b>moderate significance</b> and <b>reversible</b>.</p> <p>Operational impacts <b>low magnitude</b>, <b>long term</b> and of <b>minor significance</b> and reversible.</p>	<p>Site turbines, access tracks and other infrastructure on habitats of lowest value, where possible, overseen by ECoW. Floating roads where necessary to cross sensitive wetland habitats.</p> <p>Habitat retention, management, and creation.</p>	<p>Extremely unlikely to have a long-term negative effect, therefore <b>low magnitude</b> and of <b>minor significance</b>.</p>
<b>Species</b>			
<b>Bats</b>	<p>Impact on roosts <b>low magnitude</b>, <b>short term</b>, of <b>minor significance</b> and <b>reversible</b>.</p> <p>The effects of construction <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>During operation, due to risk of collision, negative impacts <b>medium magnitude</b>, <b>long term</b> and <b>moderate significance</b></p>	<p>Limit working to daylight hours only to avoid need for artificial lighting.</p> <p>Ensure turbine blade tips are a minimum of 50m from the edge of woodland.</p> <p>Provide bat boxes in suitable locations.</p>	<p>Improved roosting opportunities.</p> <p>Impacts reduced to <b>low magnitude</b> and of <b>minor significance</b>.</p> <p>Potential for some <b>positive</b> impact through provision of bat boxes and other habitat enhancements away from turbines.</p>
<b>Otters</b>	<p><b>Negligible</b> negative impact due to direct habitat loss.</p> <p>Construction impacts on</p>	<p>Pre-construction surveys. 30m buffer around holts, potential holts and lie-ups;</p> <p>Minimise water crossings;</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p>Potential for positive</p>

	<p>protected structures <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>However, negative impacts of <b>medium magnitude</b>, <b>short term</b> and of <b>moderate significance</b> due to potential pollution of watercourses.</p> <p>Operational impacts <b>negligible</b>.</p>	<p>Implement of strict pollution prevent measures;</p> <p>All staff to be briefed on otter structures;</p> <p>Retain scrub/woodland along watercourses;</p> <p>Cap culverts/pipes if stored overnight on site; and</p> <p>Cover excavations &gt;0.5m deep or provide ramp, also temporary exclusion fencing.</p>	<p>impact through planting along watercourses.</p> <p>Therefore <b>negligible magnitude</b> and <b>not significant</b></p>
<b>Badgers</b>	<p>Habitat loss <b>low magnitude</b>, <b>long term</b> and of <b>minor significance</b></p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operational impacts <b>low magnitude</b>, <b>permanent</b> and of <b>minor significance</b>.</p>	<p>Preconstruction surveys;</p> <p>30m buffer around setts, license if 100m from borrow pits;</p> <p>Cover excavations (see otter);</p> <p>Enhancement planting;</p> <p>All staff to be briefed on badger setts;</p> <p>Forestry operators to be briefed on sett locations.</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p>Some possible <b>positive</b> impact through improved foraging opportunities.</p>
<b>Red Squirrel</b>	<p>Habitat loss <b>negligible</b>.</p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operating impacts <b>negligible</b>.</p>	<p>Pre construction surveys for dreys;</p> <p>Woodland management.</p>	<p><b>Negligible</b> impacts</p>
<b>Pine Marten</b>	<p>Habitat loss <b>negligible</b>.</p> <p>Construction impacts <b>low magnitude</b>, <b>short term</b> and of <b>minor significance</b>.</p> <p>Operating impacts <b>negligible</b>.</p>	<p>Pre construction surveys for dreys;</p> <p>Woodland management.</p>	<p><b>Negligible</b> impacts</p>
<b>Common lizard</b>	<p>Loss of habitat <b>low magnitude</b>, <b>long term</b> and of <b>low significance</b>.</p> <p>Construction effects <b>medium magnitude</b>, <b>short term</b> and of <b>moderate significance</b>.</p> <p>Operational impacts <b>negligible</b>.</p>	<p>Ground clearance out with breeding season, site checks for reptiles, hibernaculum cleared late summer, new ones constructed.</p>	<p>Extremely unlikely to have a significant negative impact.</p> <p><b>Negligible magnitude</b> and <b>not significant</b>.</p>

Migratory Fish	Construction effects of <b>high magnitude, long term</b> and of <b>major significance</b> .	Implementation of strict pollution prevention measures; Ensuring there is no impedance to fish from new culverts or bridges.	<b>Low magnitude of minor significance and temporary</b> impacts.
Amphibians	Effects of construction <b>low magnitude of minor significance</b> . The effects of the operational wind farm are considered <b>negligible</b> .	Ground clearance out with breeding season, ponds created for amphibians.	Impact considered negligible with some <b>positive</b> effects.
Butterflies and moths	The loss of habitat <b>negligible</b> and the effects of construction and operation are also considered to be <b>negligible</b> .	Habitat enhancement.	Impact considered negligible with some <b>positive</b> effects.
<b>Cumulative Impacts</b>			
Habitats and species	Generally of low magnitude and low significance.	Following mitigation outlined above.	Mainly <b>insignificant negative impacts</b> , at worst <b>low magnitude of minor significance</b> and some positive impacts.
<b>decommissioning Impacts</b>			
Habitats and species	Slight negative cumulative impacts could occur at the local level.	Site will be assessed at the time of decommissioning and relevant mitigation put in place.	<b>Insignificant negative</b> impacts.
<b>Cumulative Impacts</b>			
Habitats and species	Generally of low magnitude and low significance.	Following mitigation outlined above.	Mainly <b>insignificant negative impacts</b> , at worst <b>low magnitude of minor significance</b> and some positive impacts.
<b>Decommissioning Impacts</b>			
Habitats and species	Slight negative cumulative impacts could occur at the local level.	Site will be assessed at the time of decommissioning and relevant mitigation put in place.	<b>Insignificant negative</b> impacts.

## Appendix 8.24a Dryfe Water: Electrofishing Survey

Written by River Annan District Salmon Fishery Board

February 2019

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### 1: Introduction

- 1.1 The Dryfe Water rises at an altitude of 585m above sea-level on the Southern slope of Loch Fell (NT316975 604300). The watercourse flows south and south-westwards for 29.3km before joining the main River Annan 3km to the west of Lockerbie (NY 310800 582050). The Dryfe Water is one of eight main tributaries that joins the mainstem of the River Annan and ranks as the fifth largest tributary in the catchment.
- 1.2 The River Annan District Salmon Fishery Board has collected extensive habitat and fish population data across the Dryfe Water catchment since 1997. Our database comprises of instream and riparian habitat assessments conducted by walkover habitat surveys along 26.8 km mainstem Dryfe Water and a further 12.3km of six key tributaries. In addition, a total of 102 electrofishing surveys with site specific habitat assessments have been undertaken between 1997 and 2018.
- 1.3 For the purpose of this report a total of eight electrofishing sites were surveyed within suitable areas of fish habitat throughout the proposed wind farm site. The Dryfe Water flows on the eastern side of the Scoop Hill wind farm site (NY 316800 595300). The objective of the surveys is to give an indication of the importance of the Dryfe Water in the vicinity of Scoop Hill for fish ecology and provide a baseline to assess any future changes in habitat or fish populations.
- 1.4 The aims of the study were as follows:
- Undertake electrofishing surveys at eight sites on the Dryfe Water
  - Analyse data obtained during the electrofishing surveys, presenting the results
  - Survey and assess river habitat information from each electrofishing site
  - Briefly comment on results and their suitability for detecting potential threats to fish populations and river ecology in general

### 2: Methodology

#### Data Recording

- 2.1 The River Annan District Salmon Fishery Board (RADSFB) is a partner in the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Scottish Executive Freshwater Fisheries Laboratory, The Tweed Foundation, the Spey Research Trust, the Tay Foundation and the River Conon District Salmon Fishery Board. This group has, in partnership, developed a set of agreed methodologies and record sheets for use with electrofishing surveys and an associated database in which to record information gathered from such surveys. The electrofishing surveys undertaken have been completed to the standards that are required by the partners of the SFCC and recorded using the formats agreed by this group.

#### Electrofishing Equipment

- 2.2 Backpack apparatus was employed during all electrofishing surveys. This equipment is powered by a double 12v lead-acid battery with a variable voltage output (generally 200 – 250 volts for the purposes of electrofishing surveys). A smooth direct current was used at all sites. The backpack is linked to a cathode of

braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.

#### Electrofishing techniques

- 2.3 Electrofishing was undertaken by a team of three SFCC accredited RADSFB staff at all survey sites using semi-quantitative single pass methodology. Electrofishing involves the surveyors passing a current through the water, which temporarily affects the fish's behaviour. When subjected to the current they exhibit a reaction known as forced swimming and swim towards the anode and are captured. The method of fishing involves the anode operator drawing stunned fish downstream to a banner net held against the current by an assistant. Normally direct current is used as this enables the use of high currents without causing untoward damage to the fish. Once captured, the fish recover in a holding container. They are then anaesthetised using a recognised fish anaesthetic (MS222), identified, measured (selected species) and recorded, and once recovered, returned unharmed to the area from which they were captured. The team works its way across and upstream the chosen area, systematically surveying all the watercourse within the selected section.

#### Age Determination

- 2.4 All juvenile salmonids are measured to the nearest millimetre. Length/frequency graphs can then illustrate year classes within the population. Age determination of individual fish can then be made by assessment of their length in relation to the entire population and the length frequency graphs. For discussion purposes, 0+ fry is the young of the fish that have hatched during spring of that survey year. Following their first winter fry develop into the parr stage and may remain in tributaries for additional 3 years, possibly longer as some fish may adapt a non-migratory life history. Parr populations will be considered collectively as 1++ for the remainder of this report. Electrofishing data sheet appendices contain the detailed length frequency graphs that quantify fish density relative to individual year class.

#### Habitat Assessment

- 2.5 At each site an assessment was made of the instream habitat available for 1++ parr stage salmonids. This assessment graded instream cover present as none, poor, moderate, good or excellent. This grading provides an index of instream cover where diverse substrate compositions will score more favourably than areas of uniform smaller substrate providing poor cover. In accordance with SFCC protocols % estimates of depths, substrate type and flow type were made at each site. Additionally, % estimates of the quantity of the bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation were made. Site habitat assessments and descriptions can be found in section 3.2.

#### Survey Measurement

- 2.6 At each site surveyed a total length was recorded and average wet and dry widths calculated. The average wet width was calculated from four - five individual widths recorded at equidistant intervals from the top of the site (0m) to the bottom. The length of each site from top to bottom was also noted. From these site lengths and average wet widths, the total area fished was calculated.

### 3: Results

#### Fish Densities & Distribution

- 3.1 Table 1 shows a minimum estimate of fish per 100m<sup>2</sup> (based on actual number of fish captured). At sites where parr (1++ fish) could be categorised into more detailed age classes this is shown in the full site reports in the appendix. For the purposes of this report the estimates of these different age classes of parr were added together to give an overall 1++ estimate.

#### Quintile Ranges

- 3.2 Densities of fish were calculated separately for 0+ fry (fish that have hatched in the year of survey) and 1++ parr (juveniles that have spent at least one winter in freshwater but have not yet been to sea) for salmon and trout. Estimates of minimum density are calculated by dividing the number of fish captured by the area of stream surveyed. To provide a guide to the relative abundance of salmonid fish sampled during the survey, minimum density estimates are classified according to the SFCC classification scheme (Godfrey, 2005) (Table 2 & 3).
- 3.3 This classification system compares minimum fish abundance sampled at 291 sites in the Solway coast region of Scotland and places abundance into six quintile ranges according to stream width at the survey site. Classes A through to E are given for abundance within each quintile range and class F represents the complete absence of fish. The 100th percentile represents the highest density found at any one of the 291 sites compared. Ultimately this system allows us to compare individual site performance against average regional targets to establish the status of fish populations.
- 3.4 The maps in Figures 2, 3, 4 & 5 illustrate the quintile ranges for each site. Quintile ranges are a site condition monitoring methodology based on the electrofishing carried out across the Solway region.

#### Site Habitat Assessments

- 3.5 Full descriptions of the types of habitats found on the survey reaches are available in the appendix. Habitat quality has been assessed on features that are suitable for supporting parr stages of Atlantic salmon. Key features for higher quality habitat are large substrates (Cobble/Boulder) and fast flows (riffle/run).

#### Habitat Descriptions

Table 4 is a summary of the habitat characteristics found at all sites during the 2018 surveys. The full habitat data set is included in the SFCC electrofishing report in the appendix.



**De0.5 (Easting: 316585 Northing: 601385)**

De0.5 is the uppermost site surveyed on the Dryfe Water, it is located on a small tributary called Duncan's Cleugh at an altitude of 357m. It is a very narrow site with an average width of less than a metre and the substrates are dominated by gravel/pebble/cobble, but a few boulders are also present, the overall instream cover is assessed as good. There is a little bankside cover (30% on each bank) in the form of undercutting and draped vegetation which could provide some cover for parr. The site is surrounded by rough sheep grazing and there is little vegetation other than grass, as a result there is no canopy cover or overhanging boughs and therefore no additional cover or shading.

**De3 (Easting: 317050 Northing: 599900)**

De3 is situated slightly downstream of an Irish bridge and sits at an altitude of 300m. Its substrate is predominately gravel/pebble/cobble with almost no boulders present, therefore the instream cover is classed as moderate. It was noticed on the day of survey that the substrate material was partly compacted, this could be attributed to the Irish bridge which slows flows possibly resulting in sediment accumulating in the substrate. There is very little cover provided by the left bank (10%) in the form of draped vegetation however the right bank is very undercut (90%) and has significant draped vegetation (60%) providing valuable parr cover. The site is located amongst scrubland with uniform low vegetation providing no additional fish cover in the form of overhanging boughs or canopy cover, despite this the level of cover on the right bank and the substrate composition could provide habitat for both fry and parr.

**De4 (Easting: 317221 Northing: 598310)**

De4 is at an altitude of 270m and shows some similarities to site De3. The instream cover is rated as moderate and the substrate is primarily gravel/pebble/cobble, though this is somewhat dominated by pebbles (50%). The site also lacks any significantly diverse vegetation or riparian habitat and therefore has no additional cover in the form of overhanging boughs or canopy cover. Unlike De3 however both banks are almost entirely bare of fish cover except from a very slight amount of undercut on the right bank (10%). This lack of bank/overhanging cover combined with the predominately pebble substrate offers limited habitat for parr life stages provides excellent spawning/fry substrates that would be equally suited to both salmon and trout species.

**DeSI1 (Easting: 317172 Northing: 596673)**

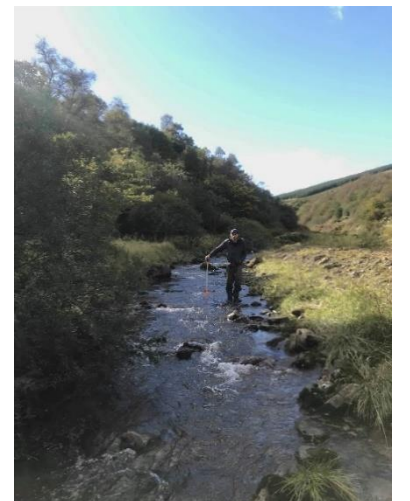
DeSI1 is on minor tributary called Stoney Gill which joins the Dryfe Water slightly downstream of a large culvert, the site is located very close to the point at which the tributary joins the main body of the Dryfe. The site is at an altitude of 256m and the instream cover is recorded as good as the substrate is dominated by larger substrates being almost entirely pebble/ cobble/ boulder. The site is surrounded by scrubland and uniform low vegetation, resulting in there being no overhanging boughs or canopy cover, however nearby conifer plantations may provide shading at some points through the day. Both banks however provide fish cover in the form of undercutting and draped vegetation which are present on 60% of each bank.

**De7 (Easting: 317180 Northing: 596644)**

Site De7 is located at an altitude of 254m, on the main body of the Dryfe Water, slightly downstream of the point at which Stoney Gill joins the river. The substrates are dominated by gravel/pebble/cobble and no boulders are present resulting in the instream quality being deemed moderate. The banks provide a high degree of fish cover with both being significantly undercut and supporting draped vegetation (70% on each). All vegetation around the site is assessed as uniform and there is a total lack of overhanging boughs or canopy cover. Dominant land use in the area is a mixture of scrubland and conifer plantations

**DeCe1 (Easting: 317175 Northing: 594684)**

Situated at 207m in altitude, site DeCe1 is on a tributary to the Dryfe Water known as the Capel. DeCe1 has substrates dominated by larger materials pebble/cobble/boulder and the instream cover is rated excellent. In contrast, the banksides are bare of vegetation or any additional fish cover. This is a natural feature of the site which is in a low gradient section of channel with large fluvial deposits of substrate material. The primary land use in the area is broadleaf and mixed woodland, though they are unfortunately at too great a distance from the site to provide any cover.





**De8 (Easting: 317257 Northing: 594658)**

Site De8 is located on a section of river that appears to have been historically straightened, slightly upstream of a large culvert it sits at an altitude of 206m. Substrate composition is dominated by pebble/cobble, but a small number of boulders are also present, as a result the instream cover is classed as good. The bank sides provide very little fish cover with only a little draped vegetation present (10% on each bank), the bank tops however show a high diversity of vegetation with broadleaf and conifer plantations forming the primary land uses. The left bank supports particularly complex vegetation and as a result 90% of the bank is covered by overhanging boughs providing cover and shade. The right bank has no overhanging boughs and the overall canopy cover for the site is 20%.

**De9 (Easting: 318610 Northing: 593994)**

The furthest downstream site sampled in this survey, De9 is located at 203m in altitude and is the first site on the Dryfe Water after it leaves commercial forestry. The instream cover is rated as good and like site De8 the substrates are dominated by pebble/cobble, but some boulders are also present. The banks provide almost no additional fish cover with only a little available, provided by a small amount of draped vegetation present on the left bank (10%). The primary land use around the site is rough pasture and therefore the bank top vegetation is uniform and mainly grass and small shrubs. This results in the site receiving no additional cover by the way of overhanging boughs or canopy cover which are not present.



## 4: Discussion

### 4.1 Habitat and Fish Populations

In its upper reaches, approximately one third of the Dryfe sub-catchment lies within an area of commercial forestry and moorland/rough grazing. Scoop Hill is located in the south west corner of this commercial forestry unit. The lower two thirds of the Dryfe sub-catchment is almost exclusively improved grazing for cattle and sheep with small areas of commercial forestry in the upper reaches of some tributaries.

The instream habitats of the Dryfe Water are dominated by large pebble/cobble substrate and this large tributary provides significant habitat for both salmon and trout throughout its entire reach. The instream and bankside cover within the proposed Scoop Hill Windfarm site can be considered generally good for salmonid species, but riparian bank top cover that creates cover/shading of watercourses is lacking. Although the land use practices are more intensive in its lower reaches the Dryfe Water generally provides good to excellent instream habitat although compaction of substrates can be an issue within modified, straightened sections. Riparian bankside cover is also fragmented and largely lacking in the lower reaches.

We do not consider historical forestry practices to have had any detrimental impact on habitat or water quality on the river environment in proximity to Scoop Hill. All planting and felling operations are within Forestry & Water guidelines.

Relative to other parts of the Annan catchment, juvenile salmonid numbers have remained consistent at sites throughout the Dryfe. We do not believe there are any significant land use pressures in this part of the system but would always advocate the creation of riparian buffer zones.

The geomorphological characteristics of the Dryfe Water create optimal instream habitat features for juvenile Atlantic salmon. There is a good mixture of both spawning/fry substrates and parr habitat at sites De3, De4, De7, De8, De9, site DeCe1 on the Capel burn. DeSl1 and De0.5 are small, high gradient tributaries that may not routinely be used by adult salmon for reproduction but will have inward migration of fry and parr.

Salmon fry densities are classed as good at site De7, fair at sites DeSl1, DeCe1, De8 and De9, very poor at sites De4 and De3 and absent at De0.5. The results indicate all sites except De0.5 are accessible to salmon and that spawning occurred in close proximity to survey sites. It is possible that salmon fry present at DeSl1 will have migrated in from the main channel of the Dryfe. Results from site De7, which is directly downstream from DeSl1, are classed as good and competition for habitat may result in salmon fry entering the Stoney Gill burn in search of new territory.

Salmon parr were absent at sites De3, De4, De7, DeCe1, DeSl1 and De0.5 and classified as very poor at De8 and De9. These results reflect poor adult returns in 2015 & 2016 which resulted in low salmon fry densities (Figure 7). It is likely that the prolonged drought in July 2018 has influenced the distribution of salmon parr which will have been forced to seek refuge in deeper pool habitats. Parr density across the Annan catchment have been low since 2014 and the results in the Scoop Hill area are within reason relative to the performance of other sites with similar characteristics on other tributaries. Although the uppermost site De0.5 is unlikely to be utilised by salmon for reproduction it is possible salmon parr could migrate inwards as large substrates are present.

Trout fry densities were classed as excellent at De3, De4, De9 and DeSl1, good at De8, fair at De7 and DeCe1. It is likely that site De0.5 would support a small population of resident brown trout characterised by population dynamics where fry:parr ratios are equal. However, it is likely any resident trout in Duncan's Cleugh burn had been affected by the prolonged drought conditions in July 2018.

Trout parr densities are classed as either fair or good at all sites, except De0.5 where they were absent. It is likely that the prolonged drought in July 2018 has also influenced the distribution of trout parr and negatively effected densities encountered at electrofishing sites. Given that the high gradient channel features (fast flowing with large substrates) are more suited to salmon and the challenges created by the summer drought, trout parr densities appear to be performing well in this part of the catchment.

Electrofishing results would indicate that all sites except for De0.5 are being utilised by migratory trout as fry numbers are significantly higher than parr. Given that instream habitat characteristics are more suited to salmon with limited marginal habitat, trout populations should be considered to be very healthy. Trout populations across the Annan catchment have improved in 2017 & 2018 following two poor years in 2015 & 2016. Surveys indicate trout densities in 2017 & 2018 are in line with long term averages and the densities indicate trout populations in the upper reaches of the Dryfe Water are attaining adequate stock recruitment levels for the available habitat.

No other native species have been identified during electrofishing surveys conducted in 2018 at sites selected for this survey. Historical records at sites De3, De4, De7, De8 & De9 also indicate no other species were encountered during any surveys conducted between 1997 and 2018. It is possible that European eel should be present, but this species has poor distribution throughout the Annan catchment due to an impassable barrier at the very downstream limit of the main river. There is a statutory requirement for the barrier to be removed or eased by 2026 and once eels can readily ascend the river it is likely they will be present within the Scoop Hill wind farm area. The general habitat features in the upper Dryfe Water (high gradient, fast flows, large substrates) are most suited to salmonids and the absence of other fish species is unsurprising.

### 4.2 Special Conservation Status

- The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.
- Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List.
- There is some protection for brown trout in terms of exploitation controls within fisheries legislation and sea trout are further protected within fisheries acts relating to the protection of 'salmon', which includes the statutory protection provided by District Salmon Fisheries Boards. In 2007 both ancestral brown trout and sea trout were added to the UKBAP Priority Species List.

### 4.3 Summary

Following analysis of the data collected in 2018 and supported by comprehensive historical datasets, the fish ecology and habitat features of the Dryfe Water within proximity to the Scoop Hill wind farm can be summarised as follows;

Our surveys identified a variety of both salmon and trout habitat for the fry and parr stages of both species. Relative to location within the upper reaches of the catchment, habitat quality can be considered optimal for both salmon and migratory trout. The Dryfe Water is a significant nursery for juvenile salmonids with good instream habitat and water quality. Despite long term fluctuations in adult salmon and migratory trout populations, juvenile densities on the Dryfe have remained relatively stable. This can be attributed to high quality instream habitat features which ensures the Dryfe produces enough emigrating salmonids to buffer

for decreased survival in estuarine and marine environments, thus ensuring egg deposition from returning adults is adequate for repopulating available habitat to carrying capacity.

**Table 1: Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
De7	52.6	0	28.4	6.9
De0.5	0	0	0	0
DeSl1	15.5	0	99.4	6.2
DeCe1	16.2	0	39.2	10.8
De3	13	0	56.1	6.7
De4	3.3	0	77.2	5.8
De8	19.8	2.6	25.8	6.0
De9	14.9	1.5	55.2	6.0

**Table 2: Quintile Explanation**

Density Figure Quintile Range	Classification
> 80th percentile to max	Excellent
> 60th percentile to < 80th percentile	Good
> 40th percentile to < 60th percentile	Fair
> 20th percentile to < 40th percentile	Poor
> present to < 20th percentile	Very Poor
Zero	Absent



**Table 3: Fish Density Classification for the Solway Region**

Salmon 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.2	1.0	1.7	0.7
20 <sup>th</sup> Percentile	3.0	6.1	11.7	7.1
40 <sup>th</sup> Percentile	8.4	16.4	19.3	11.7
60 <sup>th</sup> Percentile	19.7	33.9	32.8	22.0
80 <sup>th</sup> Percentile	37.3	54.9	48.4	38.9
100 <sup>th</sup> Percentile	221.4	167.3	125.2	120.3
Salmon 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.8	0.4	0.8	0.5
20 <sup>th</sup> Percentile	2.5	2.9	3.9	2.8
40 <sup>th</sup> Percentile	5.1	5.7	8.2	6.0
60 <sup>th</sup> Percentile	7.8	10.4	11.4	8.8
80 <sup>th</sup> Percentile	11.1	15.3	17.3	13.6
100 <sup>th</sup> Percentile	36.2	33.8	30.6	50.4
Trout 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	0.5	0.8	0.4
20 <sup>th</sup> Percentile	5.6	6.4	4.0	1.4
40 <sup>th</sup> Percentile	19.9	18.4	7.4	3.4
60 <sup>th</sup> Percentile	48.4	32.4	21.8	9.7
80 <sup>th</sup> Percentile	94.6	51.3	32.6	24.0
100 <sup>th</sup> Percentile	415.7	221.4	160.8	100.5
Trout 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	1.2	0.5	0.3
20 <sup>th</sup> Percentile	4.0	3.2	1.7	0.7
40 <sup>th</sup> Percentile	8.4	5.8	3.5	1.1
60 <sup>th</sup> Percentile	11.6	8.1	5.6	2.1
80 <sup>th</sup> Percentile	23.1	15.3	10.0	4.5
100 <sup>th</sup> Percentile	174.2	67.4	204.4	8.8

**Table 4: Habitat Characteristics For All Sites Surveyed in 2018**

Site Code	Average Wet Width (m)	Altitude (m)	Instream Cover	Dominant Substrate	Bankside Cover (%)		Riparian Cover (%)	
					Left Bank	Right Bank	Left Bank	Right Bank
De0.5	0.82	357	Good	Gravel/Pebble/Cobble	30	30	0	0
De3	4.05	300	Moderate	Gravel/Pebble/Cobble	10	90	0	0
De4	6.18	270	Moderate	Gravel/Pebble/Cobble	0	10	0	0
DeSl1	1.58	256	Excellent	Pebble/Cobble/Boulder	60	60	0	0
De7	5.28	254	Moderate	Gravel/Pebble/Cobble	70	70	0	0
DeCe1	3.7	207	Excellent	Pebble/Cobble/Boulder	0	0	0	0
De8	6.65	206	Good	Pebble/Cobble	10	10	90	0
De9	6.88	203	Good	Pebble/Cobble	10	0	0	0



Figure 1 – The Electrofishing Sites Chosen For Fish Monitoring Relating To The Scoop Hill Wind Farm Development

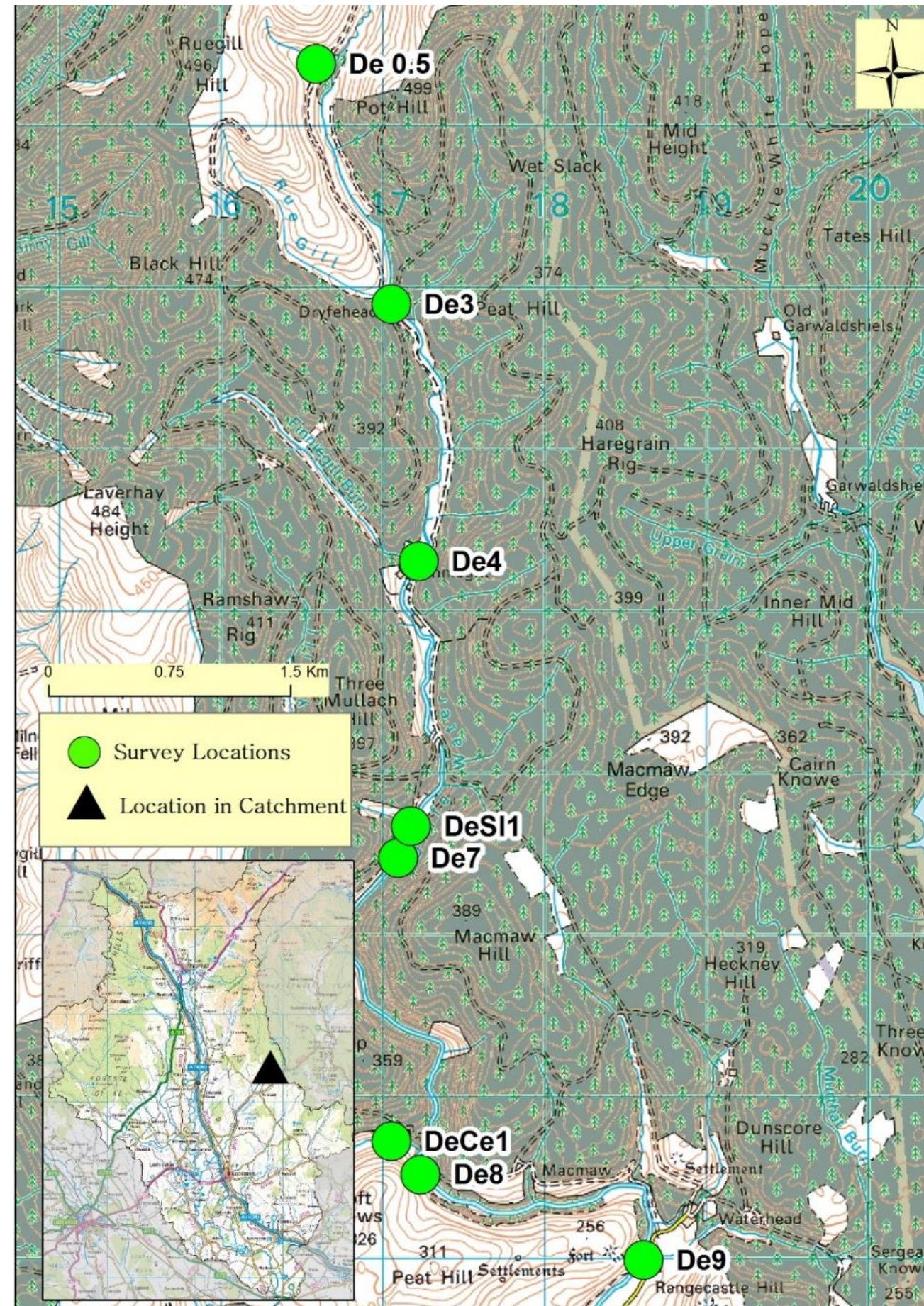




Figure 2 – Quintile Ranges for Salmon Fry Caught in 2018

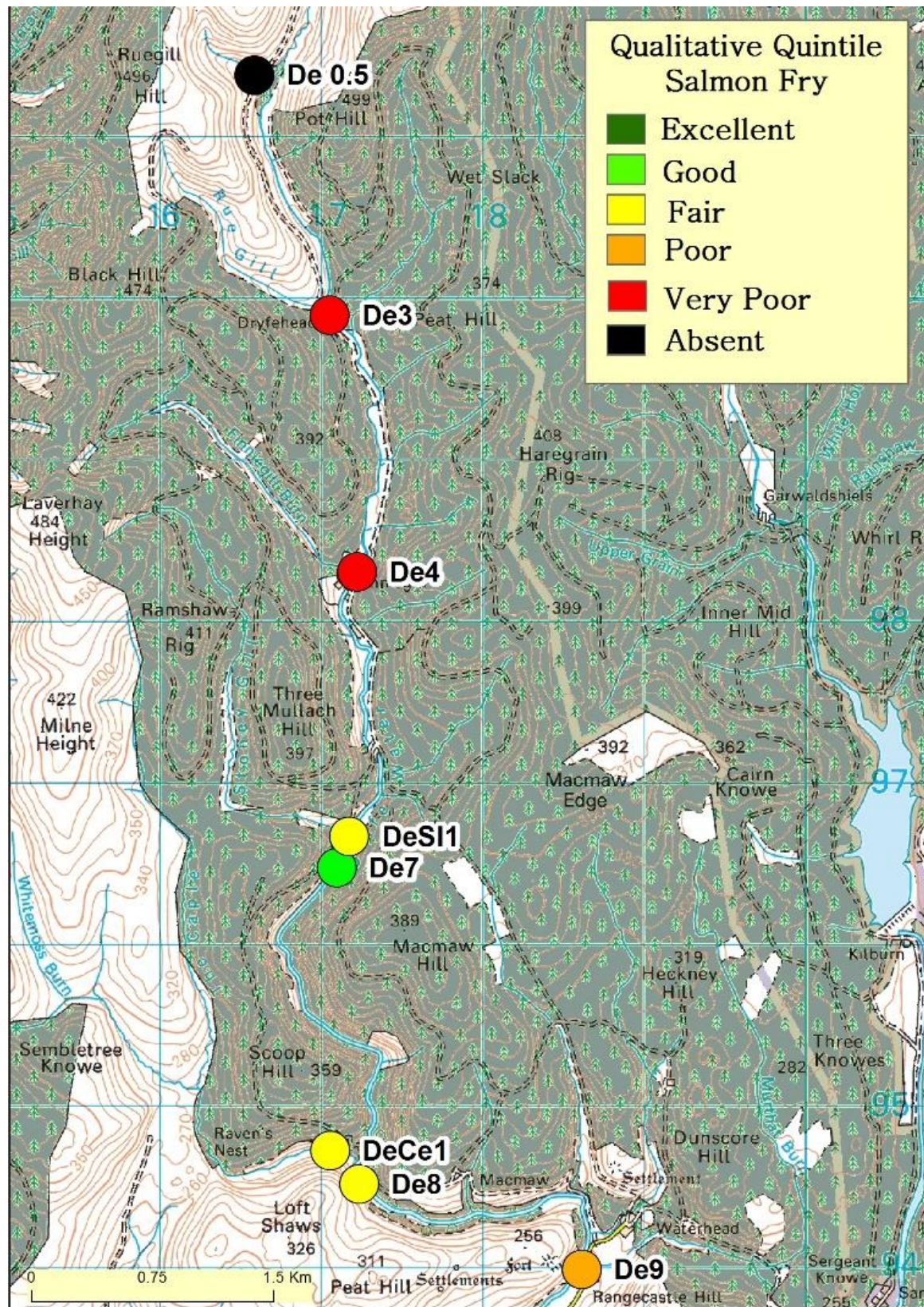


Figure 3 – Quintile Ranges for Salmon Parr Caught in 2018

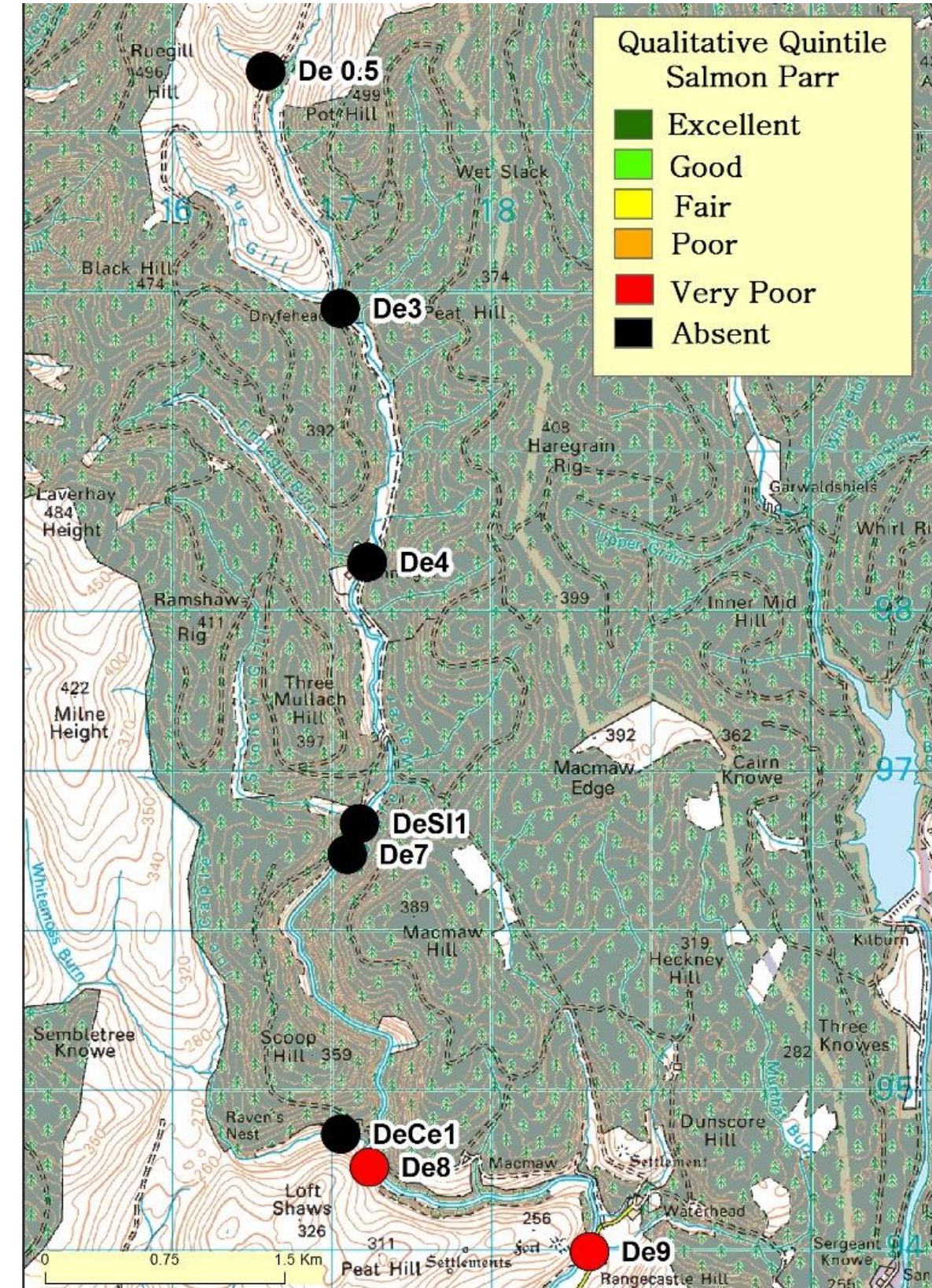








Figure 6 – Habitat Quality At All Sites in 2018

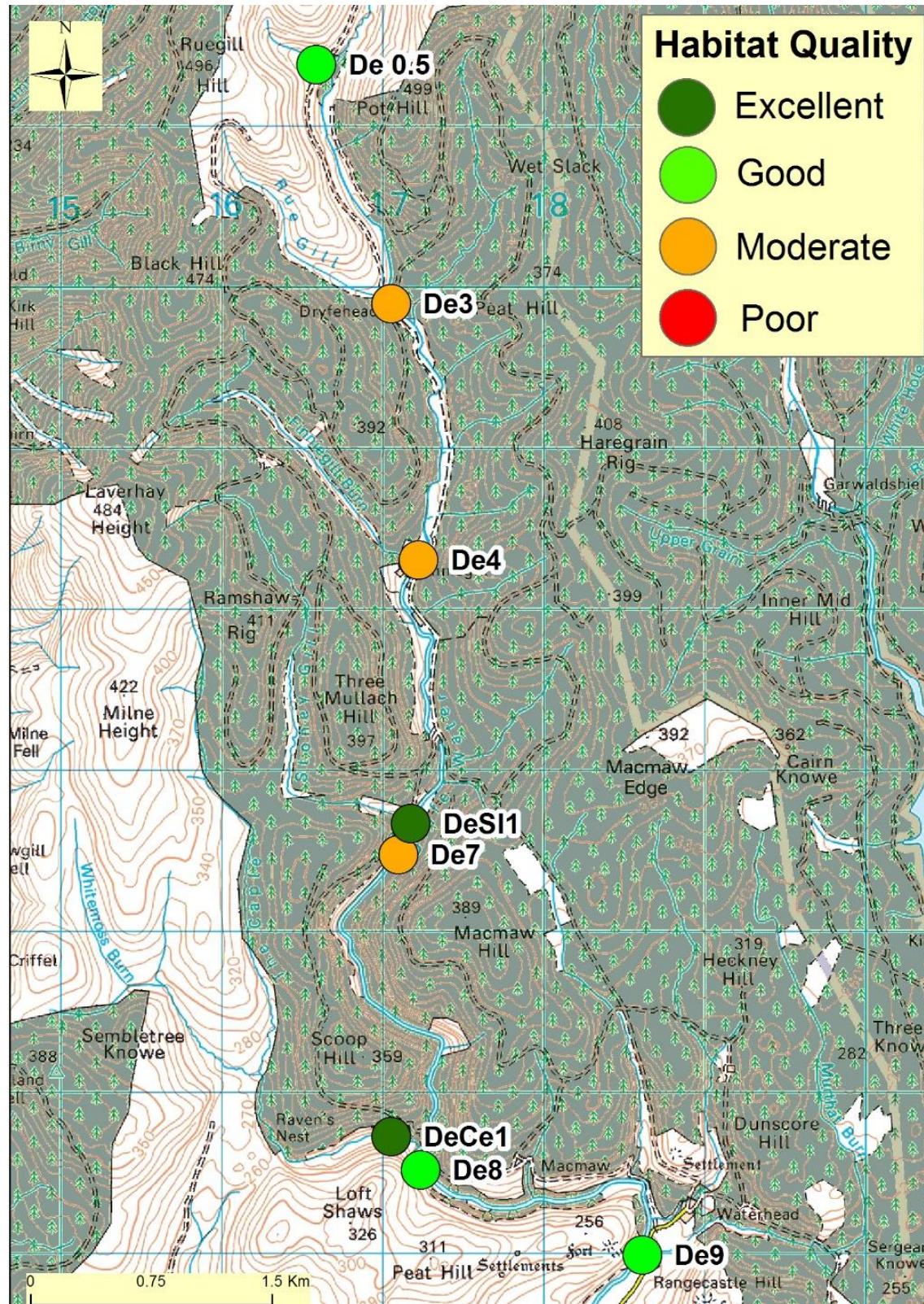
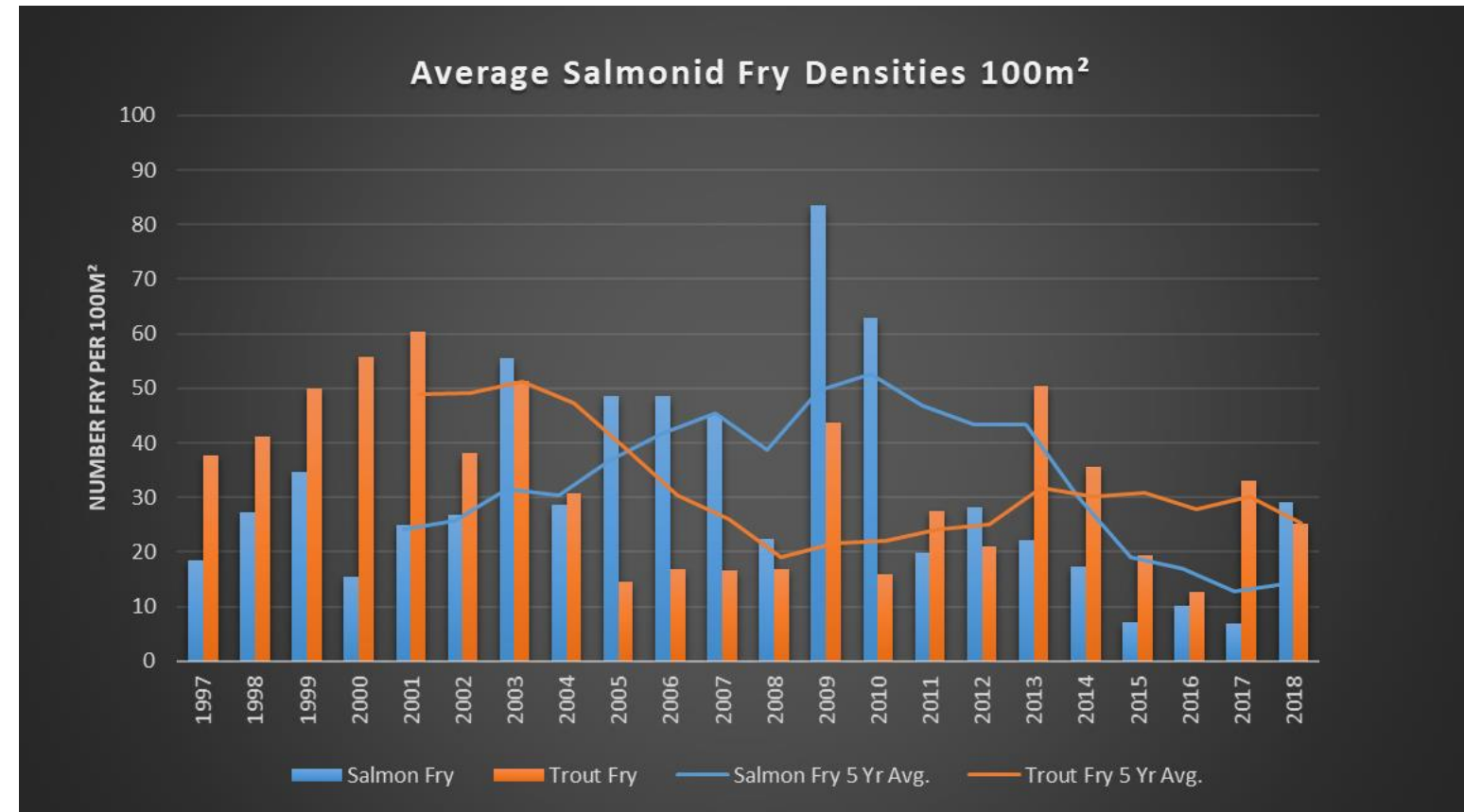


Figure 7 – Average Annual Salmon and Trout Fry Density Data Obtained from 1380 Electrofishing Surveys Conducted Between 1997 - 2018





**5: Appendix**

Easting: 316585	Northing: 601385	Site code: De0.5	Altitude:
River: Dryfe Water			
Site situation: Duncan's Cleugh, upstream of bothy and Irish bridge			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 18.0	Site Length (m): 22.0
Bed Width Area (m <sup>2</sup> ): 18.5	
Bank Width Area (m <sup>2</sup> ): 18.0	

Point No.	Measured At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	0.8	0.8	0.9
B	5.5	0.8	0.8	0.7
C	11.0	0.9	0.9	1.0
D	16.5	0.7	0.8	0.8
E-Downst	22.0	0.9	0.9	0.7

Depth

< 10	11-20	21-30	31-40	41-50	> 50
70	15	15	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	30	30	30	10	0	0	100

Flow

Flow Speed (m/s):
-------------------

Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	20	5	20	35	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	30	30
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
30	30	30	30	70	70	0	0	0	0	0	0	0	0	130	130

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	None
Capture Net:	Hand/Dip

Effective Fishing:	Yes
Conductivity:	40

Temperature:	9.00
Time:	13:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
									NaN	NaN			
Total	NaN	NaN	0	0	0	NaN							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	

Easting: 317050	Northing: 599900	Site code: De3	Altitude: 300
River: Dryfe Water			
Site situation: Dryfehead below Irish Bridge			
Access/permission: Left Bank: Til Hill Economic Forestry			Right Bank: Dito
			Date: 23/09/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon (Salmo salar)

Dimensions

Wet Width Area (m <sup>2</sup> ): 74.9	Site Length (m): 18.5
Bed Width Area (m <sup>2</sup> ): 77.2	
Bank Width Area (m <sup>2</sup> ): 80.9	

Point No.	Measured (m)	At (m)	Wet (m)	Width (m)	Bed (m)	Width (m)	Bank (m)	Width (m)
A-Upst	0.0		3.7		3.7		3.4	
B	6.0		4.2		4.4		4.5	
C	12.0		4.1		4.4		4.6	
D-Downst	18.5		4.2		4.2		5.0	

Depth

< 10	11-20	21-30	31-40	41-50	> 50
85	15	0	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Partly
Notes: Compact due to Irish bridge?	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	35	35	25	5	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	20	70	10	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	10	90
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	90	10	60	90	10	0	0	0	0	0	0	0	0	100	160

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5

Smooth Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	60

Temperature:	9.00
Time:	12:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

**Atlantic Salmon Density Report**

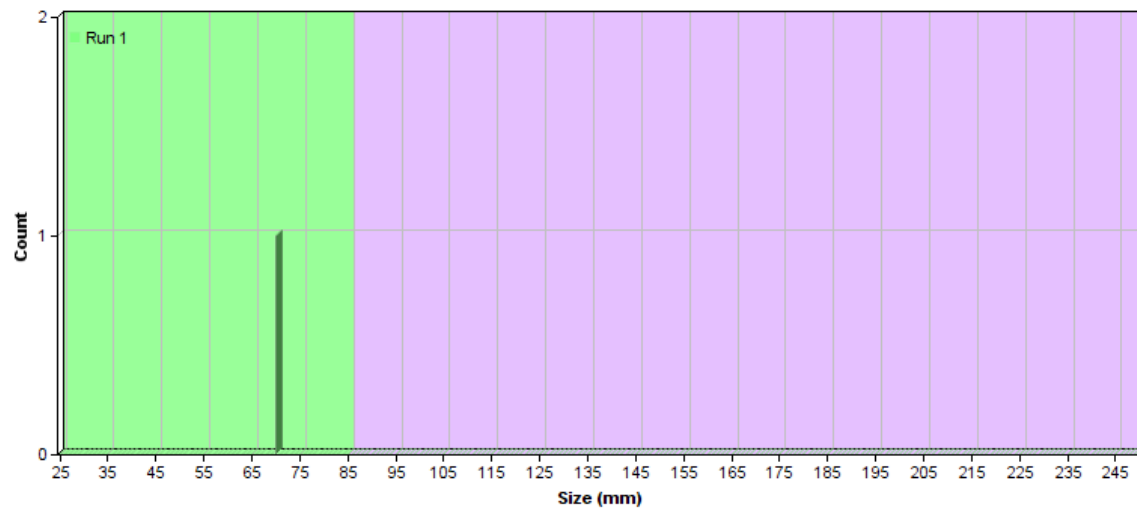
- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of



Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	0	0	0	0	1			1.335	1.335	70		
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	1	0	0	0	0	1							
Salmon Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

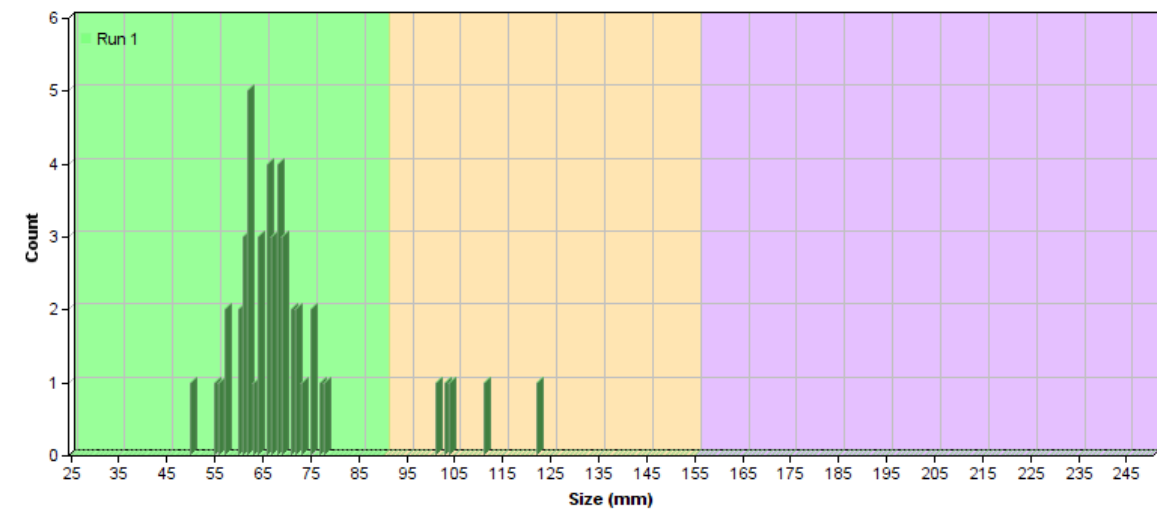


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	42	0	0	0	0	42			56.060	56.060	65	6.090	
1+	5	0	0	0	0	5			6.674	6.674	108	8.585	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	47	0	0	0	0	47							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Eastings: 317221	Northing: 598310	Site code: De4	Altitude: 270
River: Dryfe Water			
Site situation: u/s ford at Finniegill			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 14/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 120.4	Site Length (m): 19.5
Bed Width Area (m <sup>2</sup> ): 149.7	
Bank Width Area (m <sup>2</sup> ): 177.5	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.0		6.5		8.0	
B	6.5		6.1		7.0		8.4	
C	13.0		6.0		8.0		9.5	
D-Downst	19.5		6.6		9.2		10.5	

Depth

< 10	11-20	21-30	31-40	41-50	> 50
40	40	20	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	50	20	10	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	40	40	20	0	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	0	10
Bankface Veg.	Bare	Uniform
Banktop Veg.	Uniform	Simple
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	10	0	10	100	90	0	0	0	0	0	0	0	0	100	110

Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth Pulsed:	/ Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	90

Temperature:	12.50
Time:	10:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

Total	4	0	0	0	0	4							
Salmon Missed						(NaN)							

Other Fish Species Count

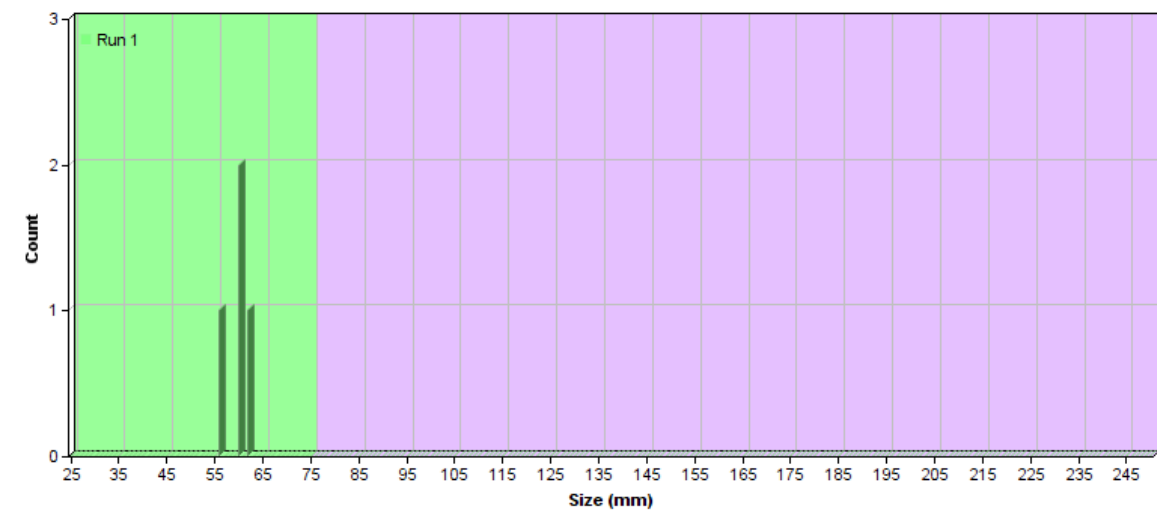
Species	Count

Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	4	0	0	0	0	4			3.322	3.322	59	2.517	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



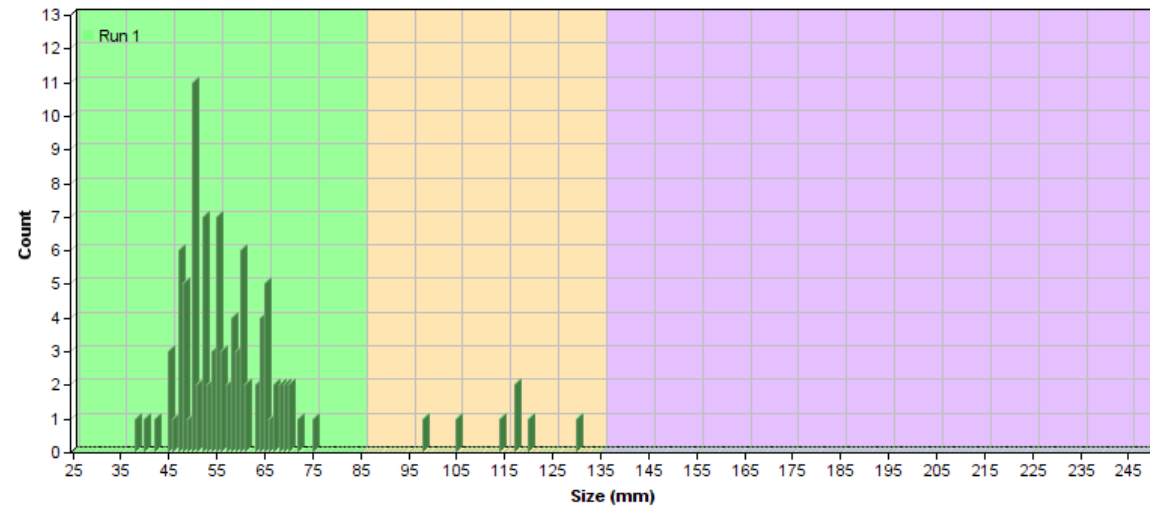
Brown Trout (Sea Trout) Density Report

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Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	93	0	0	0	0	93			77.236	77.236	55	7.808	
1+	7	0	0	0	0	7			5.813	5.813	114	10.374	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			

4++	0	0	0	0	0	0			0.000	0.000			
Total	100	0	0	0	0	100							
Trout Missed		(NaN)											

Zippin					Carle & Strub								
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability		
		Lower	Upper	95%				Lower	Upper	95%			
0+						0+							
1+						1+							
2+						2+							
3+						3+							
4++						4++							



Easting: 317172	Northing: 596673	Site code: DeSI1	Altitude:
River: Stoney Gill			
Site situation: Stoney Gill, U/s Dryfe confluence, D/s of oblong culvert			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Excellent	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 32.2	Site Length (m): 20.6
Bed Width Area (m <sup>2</sup> ): 35.5	
Bank Width Area (m <sup>2</sup> ): 32.5	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0		1.4	1.4	1.2
B	7.0		1.2	1.8	1.5
C	14.0		1.5	1.5	1.6
D-Downst	20.6		2.2	2.2	2.0

Depth

< 10	11-20	21-30	31-40	41-50	> 50
20	50	20	10	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	25	40	25	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	10	0	0	20	30	30	100

Bank

	Left Bank	Right Bank
Total Fish Cover (%)	60	60
Bankface Veg.	Uniform	Uniform



Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
60	60	60	60	40	40	0	0	0	0	0	0	0	0	160	160

Other

Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	70

Temperature:	9.00
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes

Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	✓

Other Fish Species Count

Species	Count

**Atlantic Salmon Density Report**

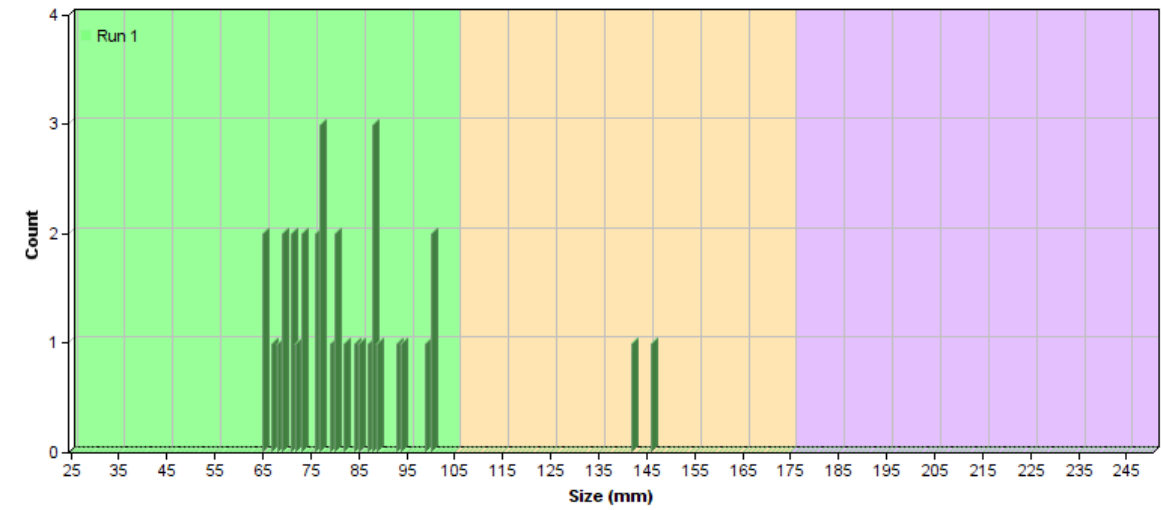
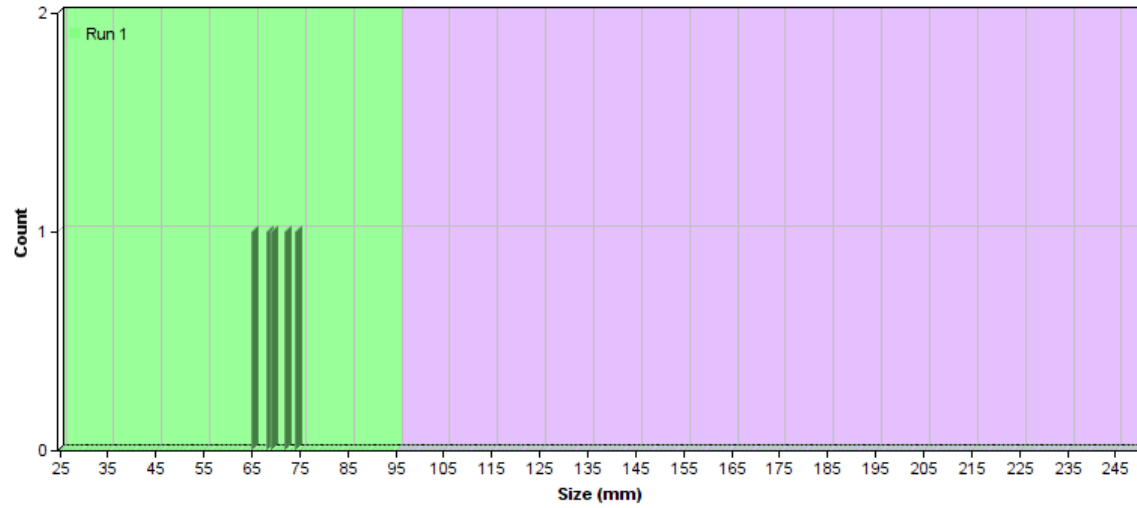
• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	5	0	0	0	0	5			15.533	15.533	69	3.507	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	5	0	0	0	0	5							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					

2+						2+					
3+						3+					
4++						4++					

1+						1+					
2+						2+					
3+						3+					
4++						4++					



**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	32	0	0	0	0	32			99.410	99.410	80	10.289	
1+	2	0	0	0	0	2			6.213	6.213	144	2.828	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	34	0	0	0	0	34							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+											

Eastings: 317180	Northing: 596644	Site code: De7	Altitude: 245
River: Dryfe Water			
Site situation: d/s Stoneygill Burn, path down from picnic bench on right bank			
Access/permission:		Date: 14/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

Dimensions

Wet Width Area (m <sup>2</sup> ): 144.5	Site Length (m): 27.4
Bed Width Area (m <sup>2</sup> ): 145.9	
Bank Width Area (m <sup>2</sup> ): 152.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		5.0		5.0		4.9	
B	9.0		5.2		5.4		5.4	
C	18.0		5.5		5.5		5.7	
D-Downst	27.4		5.4		5.4		6.2	

Depth

< 10	11-20	21-30	31-40	41-50	> 50
50	40	10	0	0	0

Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	40	40	0	0	0	100

Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	50	50	0	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	70	70
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
70	70	70	70	30	30	0	0	0	0	0	0	0	0	170	170

Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

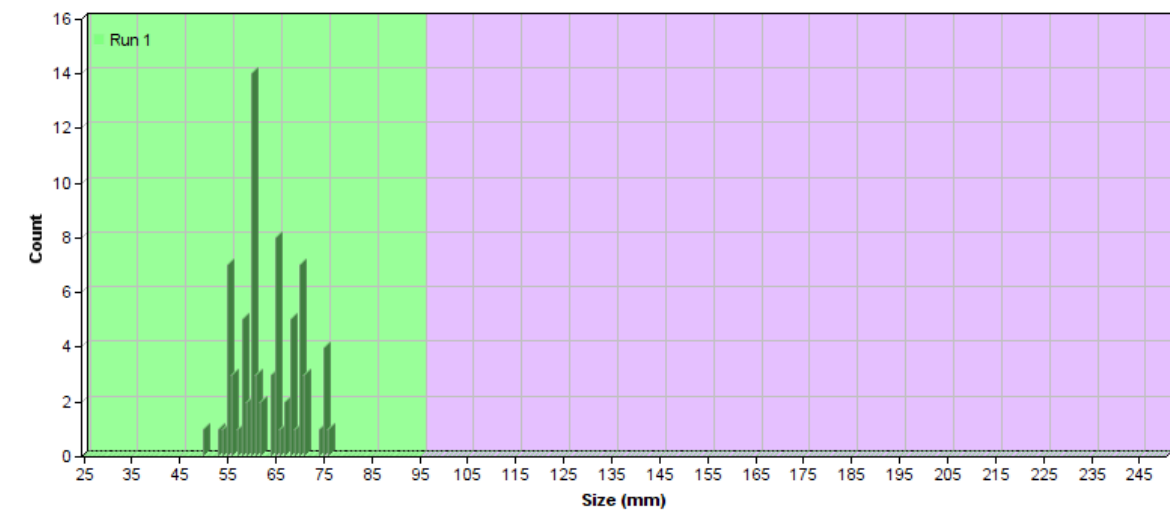
Atlantic Salmon Density Report

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	76	0	0	0	0	76			52.584	52.584	63	6.234	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

Total	76	0	0	0	0	76						
Salmon Missed						(NaN)						

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Brown Trout (Sea Trout) Density Report

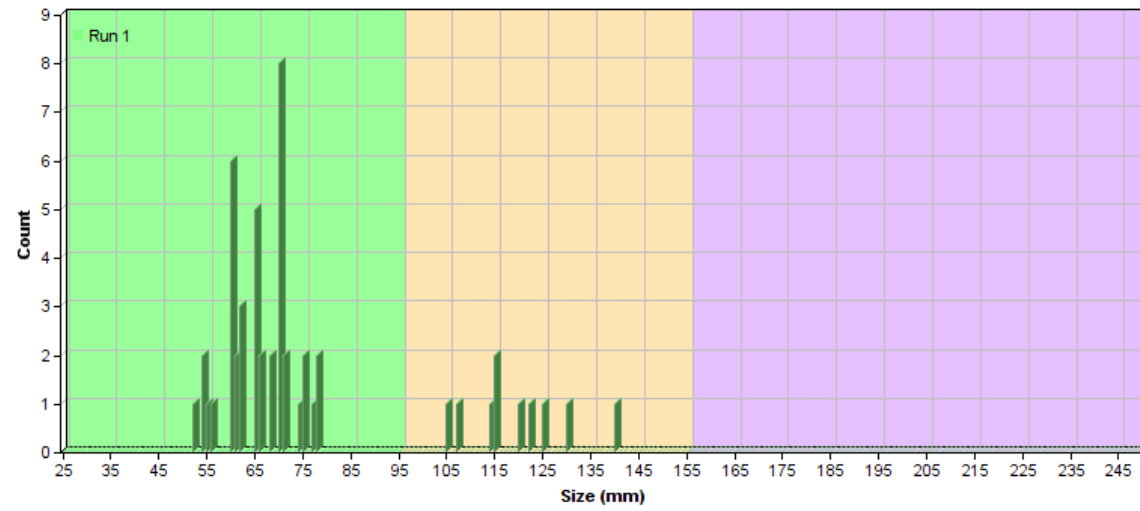
• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	41	0	0	0	0	41			28.368	28.368	65	6.781	
1+	10	0	0	0	0	10			6.919	6.919	119	10.563	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			



4++	0	0	0	0	0	0			0.000	0.000			
Total	51	0	0	0	0	51							
Trout Missed						(NaN)							

Zippin						Carle & Strub							
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability		
		Lower	Upper	95%				Lower	Upper	95%			
0+						0+							
1+						1+							
2+						2+							
3+						3+							
4++						4++							



**SFCC Electrofishing Event Report**

Easting: 317175	Northing: 594684	Site code: DeCe1	Altitude:
River: The Caple			
Site situation: u/s of Dryfe confluence			
Access/permission:		Date: 23/09/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Excellent	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 74.0	Site Length (m): 20.0
Bed Width Area (m <sup>2</sup> ): 78.5	
Bank Width Area (m <sup>2</sup> ): 121.0	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		4.0		4.0		6.7	
B	7.0		3.0		3.9		6.4	
C	14.0		3.5		3.5		5.6	
D-Downst	20.0		4.3		4.3		5.5	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
30	60	10	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	20	50	20	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	10	0	20	50	20	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Bare	Bare
Banktop Veg.	Bare	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

**Other**

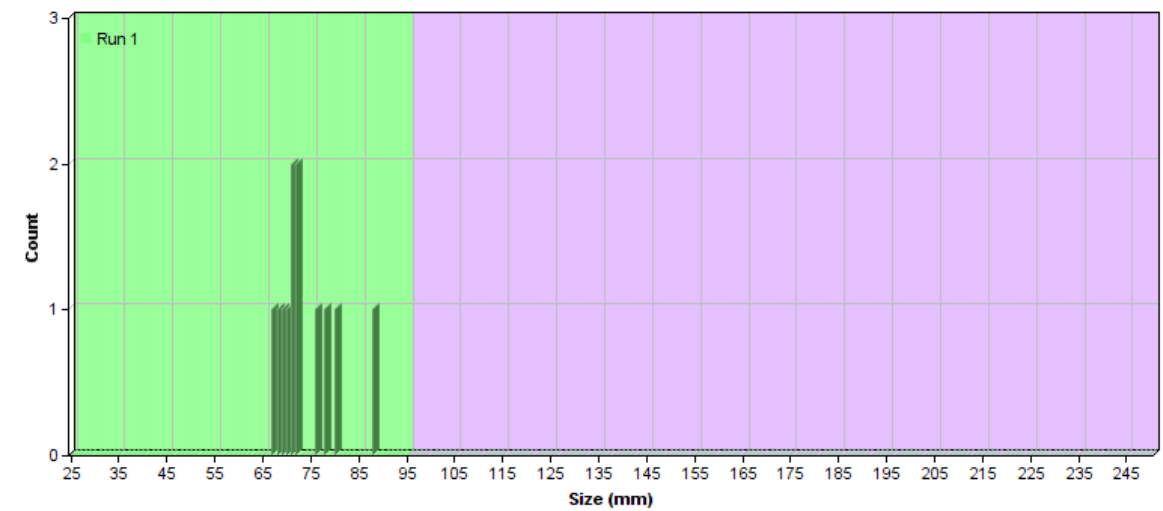
Team Leader:	Tony Donnelly
Number of Staff:	2
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes

Conductivity:	90
---------------	----

Temperature:	10.00
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

Total	12	0	0	0	0	12					
Salmon Missed						(NaN)					

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



**Other Fish Species Count**

Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

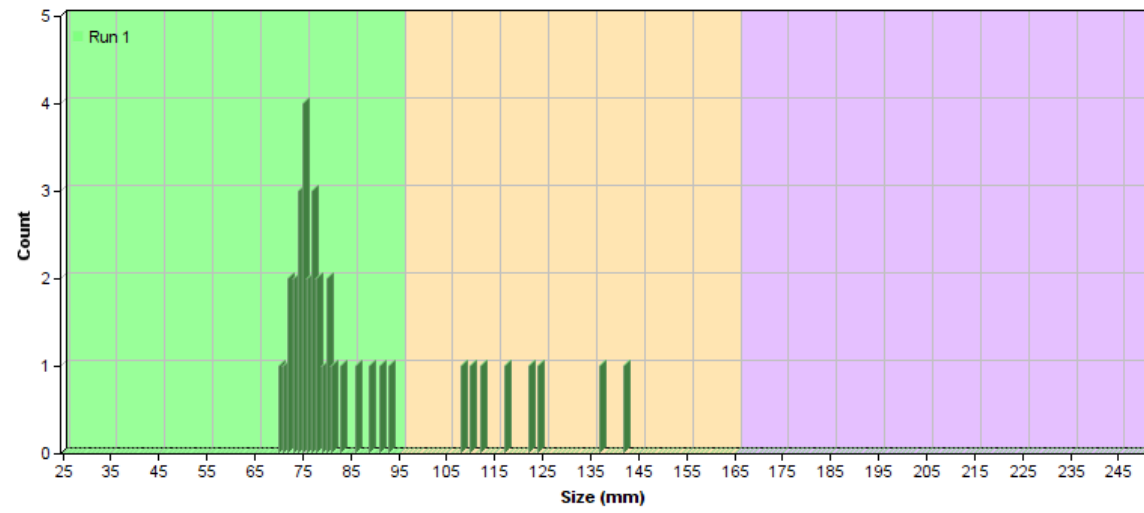
Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	12	0	0	0	0	12			16.216	16.216	73	6.038	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			

**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	29	0	0	0	0	29			39.189	39.189	77	5.824	
1+	8	0	0	0	0	8			10.811	10.811	121	12.490	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	37	0	0	0	0	37							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					





Easting: 317257	Northing: 594658	Site code: De8	Altitude: 200
River: Dryfe Water			
Site situation: riffle u/s culvert			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 14/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 116.4	Site Length (m): 17.5
Bed Width Area (m <sup>2</sup> ): 116.4	
Bank Width Area (m <sup>2</sup> ): 115.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.2		6.2		6.1	
B	6.0		6.2		6.2		6.2	
C	12.0		6.7		6.7		6.5	
D-Downst	17.5		7.5		7.5		7.5	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
20	30	20	20	10	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	30	50	10	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	30	30	30	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	10	10
Bankface Veg.	Complex	Uniform
Banktop Veg.	Complex	Complex
Overhang Bough (%)	90	0
Canopy Cover (%)	20	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	10	10	90	90	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

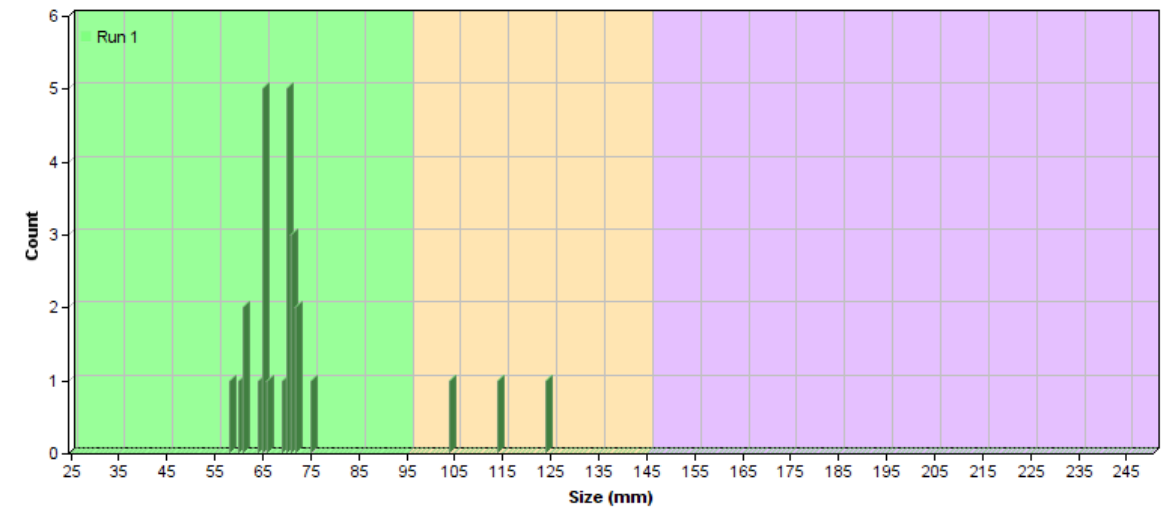
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	23	0	0	0	0	23			19.763	19.763	67	4.482	
1+	3	0	0	0	0	3			2.578	2.578	114	10.000	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	26	0	0	0	0	26							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

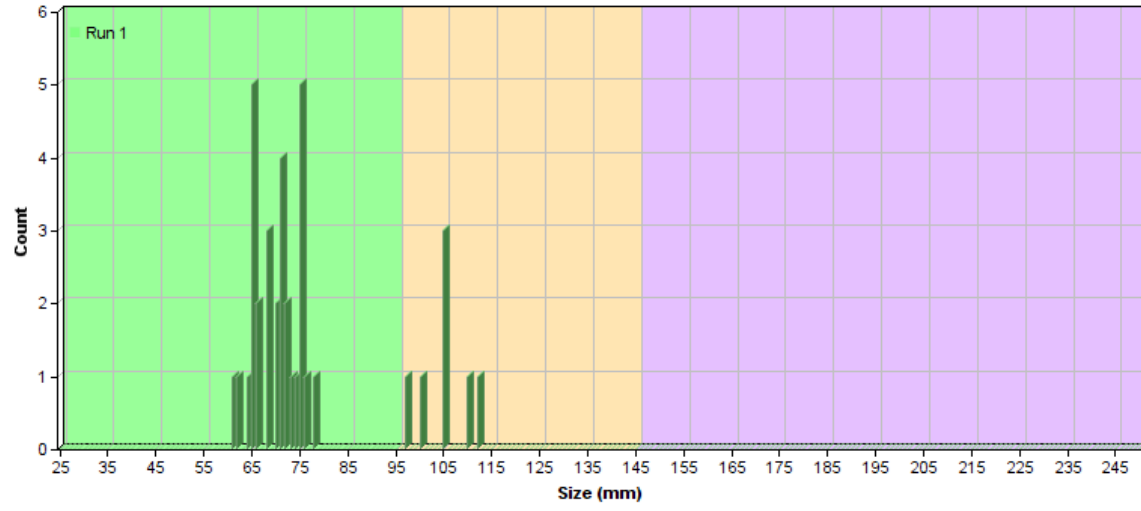


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	30	0	0	0	0	30			25.778	25.778	69	4.586	
1+	7	0	0	0	0	7			6.015	6.015	104	5.210	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	37	0	0	0	0	37							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Easting: 318610	Northing: 593994	Site code: De9	Altitude: 180
River: Dryfe Water			
Site situation: Below Waterhead and track to Macnaw, upstream of Murthat Burn			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 29/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 134.1	Site Length (m): 19.5
Bed Width Area (m <sup>2</sup> ): 134.1	
Bank Width Area (m <sup>2</sup> ): 154.5	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		8.0		8.0		10.0	
B	6.5		7.2		7.2		8.2	
C	13.0		6.0		6.0		6.5	
D-Downst	19.5		6.3		6.3		7.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	20	30	20	10	10

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	15	25	40	10	10	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	20	30	30	20	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	10	0
Bankface Veg.	Uniform	Uniform
Banktop Veg.	Uniform	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	10	0	90	100	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	320
Amps:	0.5
Smooth Pulsed:	Smooth /
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	180



Temperature:	11.50
Time:	11:30
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

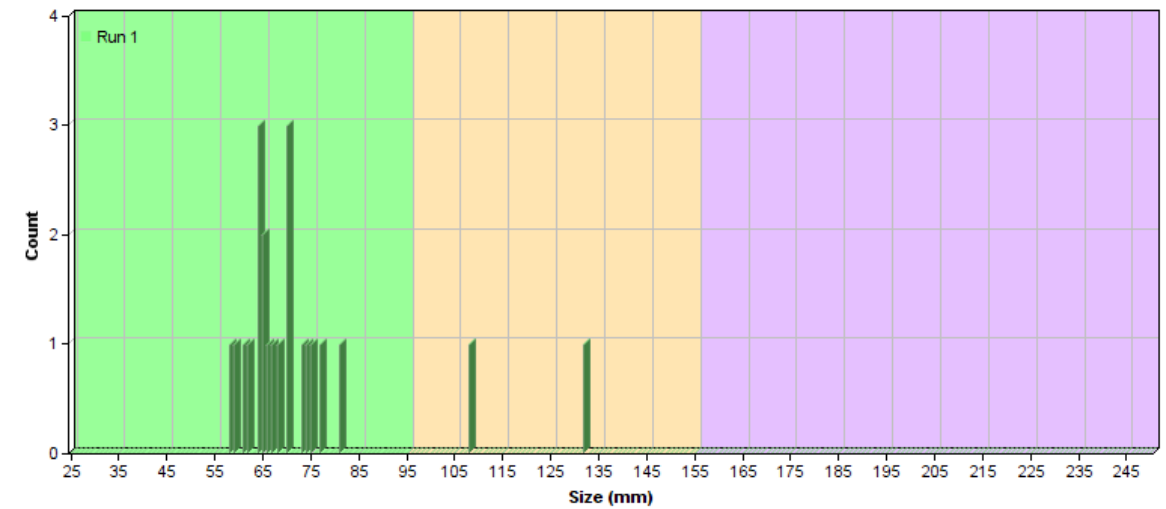
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	20	0	0	0	0	20			14.919	14.919	67	6.098	
1+	2	0	0	0	0	2			1.492	1.492	120	16.971	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	22	0	0	0	0	22							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

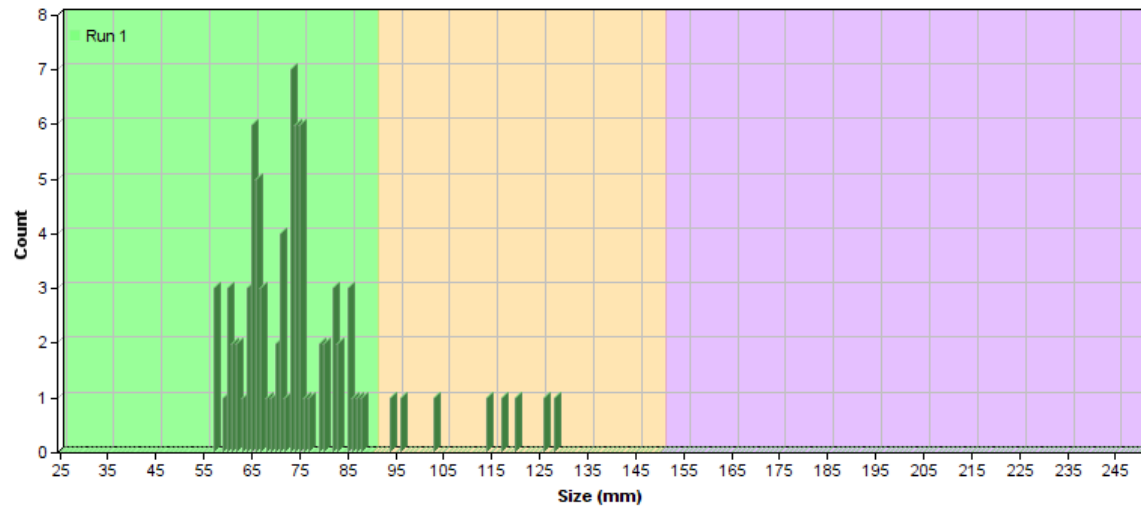


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	74	0	0	0	0	74			55.199	55.199	71	7.945	
1+	8	0	0	0	0	8			5.967	5.967	112	13.123	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	82	0	0	0	0	82							
Trout Missed						(NaN)							

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+											
1+											
2+											
3+											
4++											



## Appendix 8.24b Wamphray Water: Electrofishing Survey

Written by River Annan District Salmon Fishery Board  
February 2019  
Author: T. Donnelly, A. Gillan & C. Stones

### 1: Introduction

- 1.1 The Wamphray Water rises an altitude of 480m above sea-level from the north-western slopes of West Knowe (NT315925 605728). The watercourse flows south westwards for 13km, passing through a series of natural waterfalls in Wamphray Glen (NY312746 596452), then underneath the West Coast Main Line (NY311264 595743) before joining the main River Annan (NY310881 595065). Wamphray Water is the smallest of the eight main tributaries that form the mainstem of the River Annan and historically had an impassable culvert structure in its lower reaches. This structure served as a culvert the river channel underneath the railway line. A new culvert and fish pass were constructed in late 2015 by AMCO Engineering on behalf of Network Rail.
- 1.2 The River Annan District Salmon Fishery Board has collected extensive habitat and fish population data across the Wamphray Water catchment since 1997. Our database comprises of instream and riparian habitat assessments conducted by walkover habitat surveys along 13.3km of mainstem Wamphray Water and a further 4km of two key tributaries. In addition, a total of 53 electrofishing surveys with site specific habitat assessments have been undertaken between 1997 and 2018.
- 1.3 For the purpose of this report a total of ten electrofishing sites were surveyed within suitable areas of fish habitat throughout the proposed wind farm site. The Wamphray Water flows on the western side of the Scoop Hill wind farm site (NY316800 595300). The objective of the surveys is to give an indication of the importance of the Wamphray Water in the vicinity of Scoop Hill for fish ecology and provide a baseline to assess any future changes in habitat or fish populations.
- 1.4 The aims of the study were as follows:
- Undertake electrofishing surveys at ten sites on the Wamphray Water;
  - Analyse data obtained during the electrofishing surveys, presenting the results;
  - Survey and assess river habitat assessment information from each electrofishing site; and
  - Briefly comment on the above results and their suitability for detecting potential threats to fish populations and river ecology in general.

### 2: Methodology

#### Data Recording

- 2.1 The River Annan District Salmon Fishery Board (RADSFB) is a partner in the Scottish Fisheries Co-ordination Centre (SFCC), an initiative involving the Scottish Fishery Trusts and others, including the Scottish Executive Freshwater Fisheries Laboratory, The Tweed Foundation, the Spey Research Trust, the Tay Foundation and the River Conon District Salmon Fishery Board. This group has, in partnership, developed a set of agreed methodologies and record sheets for use with electrofishing surveys and an associated database in which to record information gathered from such surveys. The electrofishing surveys undertaken have been completed to the standards that are required by the partners of the SFCC and recorded using the formats agreed by this group.

#### Electrofishing Equipment

- 2.2 Backpack apparatus was employed during all electrofishing surveys. This equipment is powered by a double 12v lead-acid battery with a variable voltage output (generally 200 – 250 volts for the purposes of electrofishing surveys). A smooth direct current was used at all sites. The backpack is linked to a cathode of braided copper which trails in the watercourse behind the surveyor and a hand-held single anode, consisting of a pole-mounted stainless-steel ring and trigger switch.

#### Electrofishing techniques

- 2.3 Electrofishing was undertaken by a team of three SFCC accredited RADSFB staff at all survey sites using semi-quantitative single pass methodology. Electrofishing involves the surveyors passing a current through the water, which temporarily affects the fish's behaviour. When subjected to the current they exhibit a reaction known as forced swimming and swim towards the anode and are captured. The method of fishing involves the anode operator drawing stunned fish downstream to a banner net held against the current by an assistant. Normally direct current is used as this enables the use of high currents without causing untoward damage to the fish. Once captured, the fish recover in a holding container. They are then anaesthetised using a recognised fish anaesthetic (MS222), identified, measured (selected species) and recorded, and once recovered, returned unharmed to the area from which they were captured. The team works its way across and upstream the chosen area, systematically surveying all the watercourse within the selected section.

#### Age Determination

- 2.4 All juvenile salmonids are measured to the nearest millimetre. Length/frequency graphs can then illustrate year classes within the population. Age determination of individual fish can then be made by assessment of their length in relation to the entire population and the length frequency graphs. For discussion purposes, 0+ fry is the young of the fish that have hatched during spring of that survey year. Following their first winter fry develop into the parr stage and may remain in tributaries for additional 3 years, possibly longer as some fish may adapt a non-migratory life history. Parr populations will be considered collectively as 1++ for the remainder of this report. Electrofishing data sheet appendices contain the detailed length frequency graphs that quantify fish density relative to individual year class.

#### Habitat Assessment

- 2.5 At each site, an assessment was made of the instream habitat available for 1++ parr stage salmonids. This assessment graded instream cover present as none, poor, moderate, good or excellent. This grading provides an index of instream cover where diverse substrate compositions will score more favourably than areas of uniform smaller substrate providing poor cover. In accordance with SFCC protocols % estimates of depths, substrate type and flow type were made at each site. Additionally, % estimates of the quantity of the bankside features, undercut banks, draped vegetation, bare banks and marginal vegetation were made. Site habitat assessments and descriptions can be found in section 3.2.

#### Survey Measurement

- 2.6 At each site surveyed a total length was recorded and average wet and dry widths calculated. The average wet width was calculated from four - five individual widths recorded at equidistant intervals from the top of the site (0m) to the bottom. The length of each site from top to bottom was also noted. From these site lengths and average wet widths, the total area fished was calculated.

### 3: Results

#### Fish Densities & Distribution

- 3.1 Table 1 shows a minimum estimate of fish per 100m<sup>2</sup> (based on actual number of fish captured. At sites where parr (1++ fish) could be categorised into more detailed age classes this is shown in the full site reports in the appendix. For the purposes of this report estimates of these different age classes of parr were added together to give an overall 1++ estimate.

#### Quintile Ranges

- 3.2 Densities of fish were calculated separately for 0+ fry (fish that have hatched in the year of survey) and 1++ parr (juveniles that have spent at least one winter in freshwater but have not yet been to sea) for salmon and trout. Estimates of minimum density are calculated by dividing the number of fish captured by the area of stream surveyed. To provide a guide to the relative abundance of salmonid fish sampled during the survey, minimum density estimates are classified according to the SFCC classification scheme (Godfrey, 2005) (Table 3 & 4).
- 3.3 This classification system compares minimum fish abundance sampled at 291 sites in the Solway coast region of Scotland and places abundance into six quintile ranges according to stream width at the survey site. Classes A through to E are given for abundance within each quintile range and class F represents the complete absence of fish. The 100th percentile represents the highest density found at any one of the 291 sites compared. Ultimately this system allows us to compare individual site performance against average regional targets to establish the status of fish populations.
- 3.4 The maps in figures 2, 3, 4 & 5 illustrate the quintile ranges for each site.

#### Site Habitat Assessments

- 3.5 Full descriptions of the types of habitats found on the survey reaches are available in the appendix

#### Habitat Descriptions

- 3.6 Table 4 is a summary of the habitat characteristics found at all sites during the 2018 surveys. The full habitat data set is included in the SFCC electrofishing report in the appendix.



**Wy0.5 (Easting: 314912 Northing: 601326)**

At an altitude of 225m, Wy 0.5 is the uppermost site surveyed in this report. Substrates are dominated by pebble/cobble and instream cover is assessed as good. There is some bankside cover (60% right bank) in the form of undercut with draped vegetation features providing additional cover for 1++ parr stages. Although bordered by commercial forestry, riparian cover is lacking with limited overhanging boughs/shading from the left bank. Although bankside and riparian habitat is limited the instream substrates provide suitable cover for fry and parr stages

**Wy7 (Easting: 313400 Northing: 596880)**

Wy7 is located 380 metres downstream of Wy6 at an altitude of 152m. Substrates are dominated by pebbles and cobble at this site and instream cover is assessed as good. There is no bankside cover on either the right or left bank. Riparian cover is limited (10% on the right bank and 10% on the left bank) providing a small amount of cover and shading. Despite the good instream cover no salmon were recorded at Wy7 despite being found upstream

**Wy1 (Easting: 313875 Northing: 599125)**

Site Wy 1 is located at an altitude of 170m, with the large boulder pictured marking the downstream extent of the site. Habitat is generally good at this site with pebble/cobble dominated substrates providing good instream cover. Abundant riparian tree cover on the right bank (60%) provides plenty of shade, however the left bank is considerably less vegetated with only 10% riparian cover. Bankside cover is moderate on the right bank (30%) but limited on the left bank (10%). Several large boulders create additional habitat for 1++ parr stages. Directly upstream of the site is a densely wooded section of river which provides excellent cover and shading for fish.

**Wy2 (Easting:312939 Northing:596526)**

Wy2 is located at an altitude of 131m and is situated just upstream of a high gradient, bedrock section that contains a natural waterfall. The waterfall does pose a challenge to migratory salmonids but has been assessed as passable in certain flow conditions. Substrates are dominated by gravel, pebbles and cobble at this site and instream cover is assessed as poor. Although the pebble/cobble substrates lend themselves to salmon spawning, these are situated on top of a layer of bedrock. As a result, the substrate may be of insufficient depth for spawning and subject to wash out during high flows. Neither bank provide any bankside cover. Salmon parr were found at the site in 2016 & 17 are likely to be survivors from the 2015 introduction of salmon fry, relocated from below the culvert.

**Wy6 (Easting: 313610 Northing: 597190)**

Wy6 is located at an altitude of 152m. Substrates are dominated by pebble and small cobble at this site and instream cover is assessed as good. There is no bankside cover on either the right or left bank. Riparian cover is also lacking with none recorded on either bank.

**Wy8 (Easting: 311900 Northing: 596200)**

Wy 8 is located at an altitude of 117m and is situated approximately 1.7km upstream of the newly installed fish pass. Instream habitat at the site is classed as good and substrates are predominantly comprised of pebble and cobble. Bankside cover is absent on both banks. Riparian cover is lacking with no overhanging boughs/shading from the right bank and only 10% cover on the left bank.





**Wy3 (Easting: 311900 Northing: 596200)**

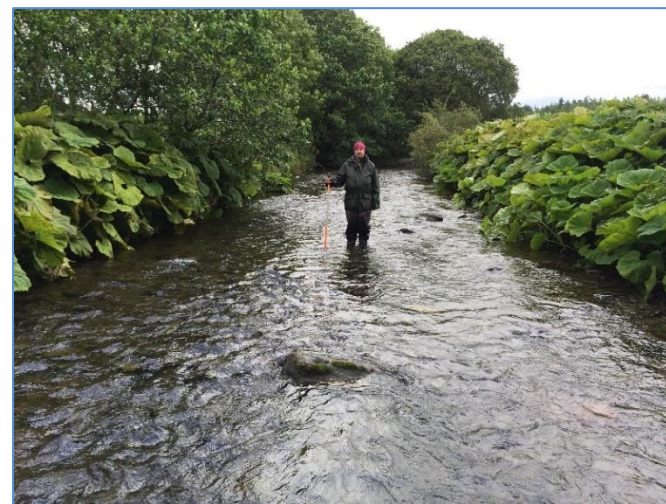
Wy 3 is located at an altitude of 89 m and is situated approximately 800m upstream of the newly installed fish pass. The river channel has been straightened significantly through this section. Instream habitat at the site is classed as good and substrates are comprised predominately of pebble and cobble. Bankside cover is absent on the left bank and limited on the right bank (5%). Riparian cover is lacking with no overhanging boughs/shading from the left bank and only 5% cover on the left bank.

**Wy4 (Easting: 311169 Northing:595618)**

Wy 4 is located at an altitude of 75m and is situated in a straightened section of the Wamphray Water, downstream of the newly installed fish pass. Instream cover is described as good at this site and is predominately cobble. No riparian cover is present within the survey site. The left bank provides no bankside cover while the riprap installed to reinforce the right bank provides 100% cover creating good instream habitat for salmonid parr and other species such as European eel.

**Wy5 (Easting:310959 Northing:595359)**

Wy5 is the furthest downstream of the sites included in this report and is situated at an altitude of 73m. Again, the river has been straightened significantly through this section. Instream habitat at the site is classed as good and substrates are comprised of predominately pebble and cobble. Bankside cover is absent on the left bank however draped vegetation provides 70% cover on the right bank. Riparian cover is lacking with no overhanging boughs/shading on the left or right bank.



## 4: Discussion

### 4.1 Habitat and Fish Populations

The Wamphray Water is a high gradient watercourse with natural morphological features along the vast majority of its channel. The instream habitats of the Wamphray Water are dominated by large pebble/cobble substrate and this high gradient tributary provides significant habitat for both salmon and trout throughout its entire reach, both upstream and downstream of the natural waterfalls in Wamphray Glen.

Due to the steep nature of Wamphray catchment there is limited fish habitat available in the tributaries running down the steep hillsides and many of the watercourses are ephemeral habitat. The river channel has been significantly straightened in its lower reaches which has resulted in the substrates becoming partly compacted and potentially limiting the suitability of habitat for 1++ parr. This straightened section is flanked by low productivity improved grassland on both banks.

The land use within the Scoop Hill wind farm area is exclusively commercial forestry. There is some light/moderate grazing from sheep and cattle in the Laverhay section on the southern edge of the proposed site. There are no significant land use practices limiting fish populations in this part of the system. However, walkover surveys indicate around 70% of the banksides would benefit from the creation of riparian buffer zones to increase bankside cover and shading for fish.

We do not consider historical forestry practices to have had any detrimental impact on habitat or water quality on the river environment in proximity to Scoop Hill. Significant felling operations are due to commence in 2019 and tracks have been upgraded in 2018. All planting and felling operations are currently within Forestry & Water guidelines.

Between 1996 and 2016, over 12km of the Wamphray Water was inaccessible to migratory fish due to a culvert under the West Coast Main Line. In 2011 the culvert was assessed by the River Annan District Salmon Fishery Board as a complete barrier to upstream fish migration for all species due to the effective swim length, high velocity and shallow depth of water on the structure. In the highly unlikely event of fish negotiating this part of the structure the jump barrier at the end of the culvert was also impassable due to the lack of jump pool, height and gradient. This assessment was consistent with historical electrofishing data which only juvenile brown trout (*Salmo trutta*) above the structure. Population dynamics of trout above the culvert were typical of a resident/isolated population with low fry density at ratios equal to parr.

Sites Wy0.5, Wy1, Wy2, Wy6 & Wy7 are located upstream of the natural waterfalls and cascades in Wamphray Glen. Figures 2 & 4 illustrate the stark contrast of salmon and trout fry densities encountered upstream and downstream of Wamphray Glen. Surveys in 2017 also failed to identify signs that adult salmonids had successfully ascended the falls. The obstacles within Wamphray Glen have been assessed as passable at certain flow conditions and there was historical information that salmon and sea trout can make it through this high gradient section. Salmon and trout have been observed attempting to ascend the falls in autumn 2017 & 2018 and the Fishery Board recommends that surveys should continue until 2021 before conclusions can be made about passability.

Sites Wy3, Wy8 & Wy9 are situated upstream of the West Coast Main Line and downstream of Wamphray Glen. Sites Wy3 and Wy8 provide a good mixture of salmon dominated fry and parr habitat while site Wy9 is an optimal spawning area for both salmon and trout. All three sites are in the vicinity of the full spectrum of suitable habitat for fry and parr stages of both species. Instream habitat within reach of stream in this section is of very high quality. 2018 salmon and trout fry densities are classed as excellent at all three sites which bodes well for the rapid recolonization of newly accessible habitat. Parr densities were disappointing for both species but poor adult recruitment in tributaries 2017 coupled with the drought conditions in 2018 are likely to be the cause.

Relative to other parts of the Annan catchment, juvenile salmonid numbers (Fig 7) have remained consistent at the historically accessible sites downstream of the railway line. Sites Wy4 & Wy5 have regularly record some of the highest salmon fry densities in the catchment between 1997 and 2015 sometimes exceeding 300 fry per 100m<sup>2</sup>. This is an artefact of fish having limited access to the lower reaches of the Wamphray and multiple fish using the same spawning substrates. Since the installation of the fish pass salmon fry densities have remained excellent and trout fry numbers are within expected ranges given that adult salmon will dominate spawning territory and overcut trout redds, thus displacing eggs. Given the high densities of salmon fry and trout which are routinely encountered at Wy4 & Wy5, subsequent parr densities are disappointing. This can be attributed to the partly compacted nature of the substrates and the proximity to the main River Annan that provides more optimal parr habitat just a few hundred meters downstream.

Stone loach (*Barbatula barbatula*) have been identified at sites Wy4 and Wy5 downstream of the railway line in most survey years. This species is widely distributed in low gradient sites around the catchment and its presence on the lower reaches on the Wamphray should be expected. Despite the presence of a large impassable structure at the bottom of the river a limited number of European eels (*Anguilla anguilla*) can bypass the structure by moving over land to ascend into the main river. The bankside cover along the right bank at site Wy4 created by the placement of large boulders which act as bank protection creates optimal habitat for eels. Many of the eels recorded across the catchment are associated with physical structures such as bridges, walls and grey bank protection that provides eels with deep. There is a statutory requirement for the barrier at the foot of the Annan to be removed or eased by 2026 and habitat on the Wamphray is likely to be recolonised following this remedial action.

#### 4.2 Special Conservation Status

- The Conservation of Salmon (Scotland) Regulations 2016 outlined for the first time a system whereby the killing of Atlantic salmon in inland waters is managed on an annual basis by categorising the conservation status of their stocks.
- Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List.
- There is some protection for brown trout in terms of exploitation controls within fisheries legislation and sea trout are further protected within fisheries acts relating to the protection of 'salmon', which includes the statutory protection provided by District Salmon Fisheries Boards. In 2007 both ancestral brown trout and sea trout were added to the UKBAP Priority Species List.

#### 4.3 Summary

Following analysis of the data collected in 2018 and supported by comprehensive historical datasets, the fish ecology and habitat features of the Wamphray Water within proximity to Scoop Hill wind farm can be summarised as follows;

Our surveys identified a good mixture of salmon and trout habitats for both fry and parr stages of the two species. Habitat can be considered optimal for salmon and migratory trout throughout all the Wamphray Water except within the high gradient bedrock section which forms Wamphray Glen. The Wamphray Water has the potential to function as a significant nursery for juvenile salmonids. Given the quality of the instream habitat we predict that good to excellent quintile ranges would be consistently found at sites accessed by returning adult salmon and trout in future. Natural population dynamics are still establishing following the installation of a highly effective fish pass in 2016 and ongoing monitoring will be required to quantify the carrying capacity for the different life stages of both species.

Electrofishing results from Wy4 and Wy5 clearly indicates that Wamphray has excellent potential for spawning/fry stages and that parr may descend into the deeper pools/runs on the main river just a few hundred meters downstream. Early indications at sites Wy3, Wy8 and Wy9 are that migratory salmon and trout are utilising this newly available habitat and depositing adequate numbers of ova to populate habitat to carrying capacity. The ability of sites Wy3, Wy8 & Wy9 to support parr stages can be quantified from 2020 onwards once competition between multiple year classes has been established. There is still uncertainty about the ability of adult salmonids to ascend the natural waterfalls in Wamphray Glen and access sites Wy0.5, Wy1, Wy2, Wy6 & Wy7. It may be 2021 before any conclusions can be made about the success of fish to pioneer into the abundance of high-quality habitat in the vicinity of Laverhay and further upstream in the Scoop Hill wind farm area.



**Table 1: Minimum Juvenile Salmonid Density per 100m<sup>2</sup> Found in 2018**

Site	2018		2018	
	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Wy0.5	0.0	0.0	9.6	7.9
Wy1	0.0	0.0	3.8	1.0
Wy2	0.0	0.0	1.9	4.0
Wy3	102.6	3.6	30.3	7.0
Wy4	243.5	7.0	49.7	0.0
Wy5	133.8	1.0	12.4	0.0
Wy6	0.0	0.0	3.0	3.0
Wy7	0.0	0.0	1.2	3.0
Wy8	205.0	5.9	35.3	1.0
Wy9	337.4	1.5	82.1	0.0

**Table 2: Quintile Explanation**

Density Figure Quintile Range	Classification
> 80th percentile to max	Excellent
> 60th percentile to < 80th percentile	Good
> 40th percentile to < 60th percentile	Fair
> 20th percentile to < 40th percentile	Poor
> present to < 20th percentile	Very Poor
Zero	Absent

**Table 3: Fish Density Classification for the Solway Region**

Salmon 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.2	1.0	1.7	0.7
20 <sup>th</sup> Percentile	3.0	6.1	11.7	7.1
40 <sup>th</sup> Percentile	8.4	16.4	19.3	11.7
60 <sup>th</sup> Percentile	19.7	33.9	32.8	22.0
80 <sup>th</sup> Percentile	37.3	54.9	48.4	38.9
100 <sup>th</sup> Percentile	221.4	167.3	125.2	120.3
Salmon 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.8	0.4	0.8	0.5
20 <sup>th</sup> Percentile	2.5	2.9	3.9	2.8
40 <sup>th</sup> Percentile	5.1	5.7	8.2	6.0
60 <sup>th</sup> Percentile	7.8	10.4	11.4	8.8
80 <sup>th</sup> Percentile	11.1	15.3	17.3	13.6
100 <sup>th</sup> Percentile	36.2	33.8	30.6	50.4
Trout 0+	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	0.5	0.8	0.4
20 <sup>th</sup> Percentile	5.6	6.4	4.0	1.4
40 <sup>th</sup> Percentile	19.9	18.4	7.4	3.4
60 <sup>th</sup> Percentile	48.4	32.4	21.8	9.7
80 <sup>th</sup> Percentile	94.6	51.3	32.6	24.0
100 <sup>th</sup> Percentile	415.7	221.4	160.8	100.5
Trout 1++	Channel Width			
	<4m	4-6m	>6m	>9m
0 <sup>th</sup> Percentile	0.7	1.2	0.5	0.3
20 <sup>th</sup> Percentile	4.0	3.2	1.7	0.7
40 <sup>th</sup> Percentile	8.4	5.8	3.5	1.1
60 <sup>th</sup> Percentile	11.6	8.1	5.6	2.1
80 <sup>th</sup> Percentile	23.1	15.3	10.0	4.5
100 <sup>th</sup> Percentile	174.2	67.4	204.4	8.8

**Table 4: Habitat Characteristics For All Sites Surveyed in 2018**

	Site Code	Average Wet Width (m)	Altitude (m)	Instream Parr Cover	Dominant Substrate	Bankside Cover (%)		Riparian cover (%)	
						Left bank	Right bank	Left bank	Right bank
<b>Upstream of culvert &amp; fish pass</b>	Wy0.5	3.82	225	Good	Pebble/Cobble	0	0	10	0
	Wy1	4.73	170	Good	Pebble/Cobble	0	15	0	95
	Wy6	5.25	152	Good	Pebble/Cobble	0	10	0	10
	Wy7	5.63	152	Moderate	Pebble/Cobble	0	0	100	100
	Wy2	5.25	131	Poor	Bedrock	0	20	0	100
	Wy8	6.18	117	Good	Pebble/Cobble	0	0	100	0
	Wy9	4.70	109	Moderate	Pebble/Cobble	0	0	60	0
	Wy3	7.37	89	Good	Pebble/Cobble	5	10	10	10
<b>Downstream of culvert</b>	Wy4	4.03	75	Good	Pebble/Cobble	10	100	0	0
	Wy5	6.03	73	Good	Pebble/Cobble	0	60	0	20



Figure 1 – The Electrofishing Sites Chosen For Fish Monitoring Relating To The Scoop Hill Wind Farm Development

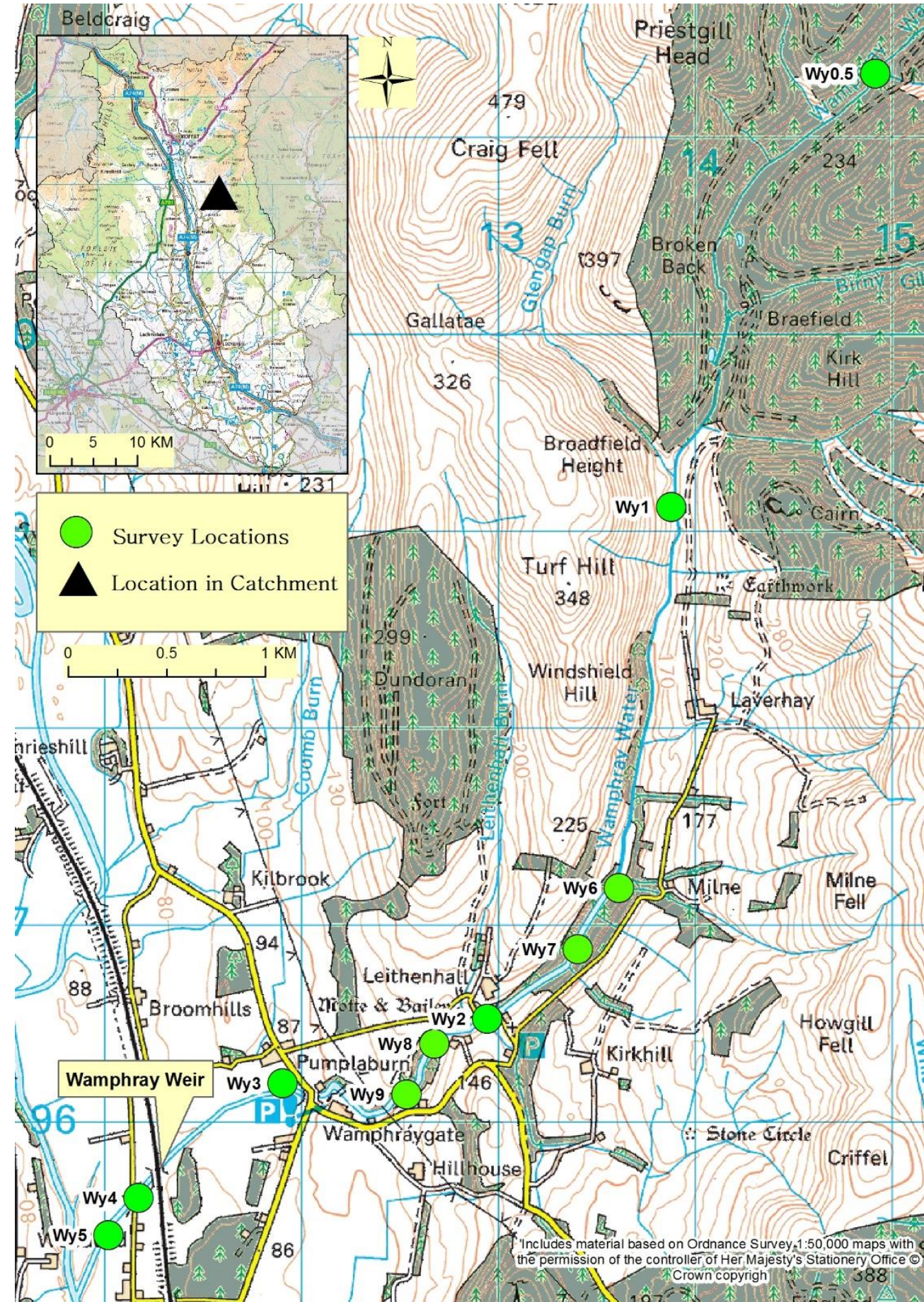




Figure 2 – Quintile Ranges for Salmon Fry Caught in 2018

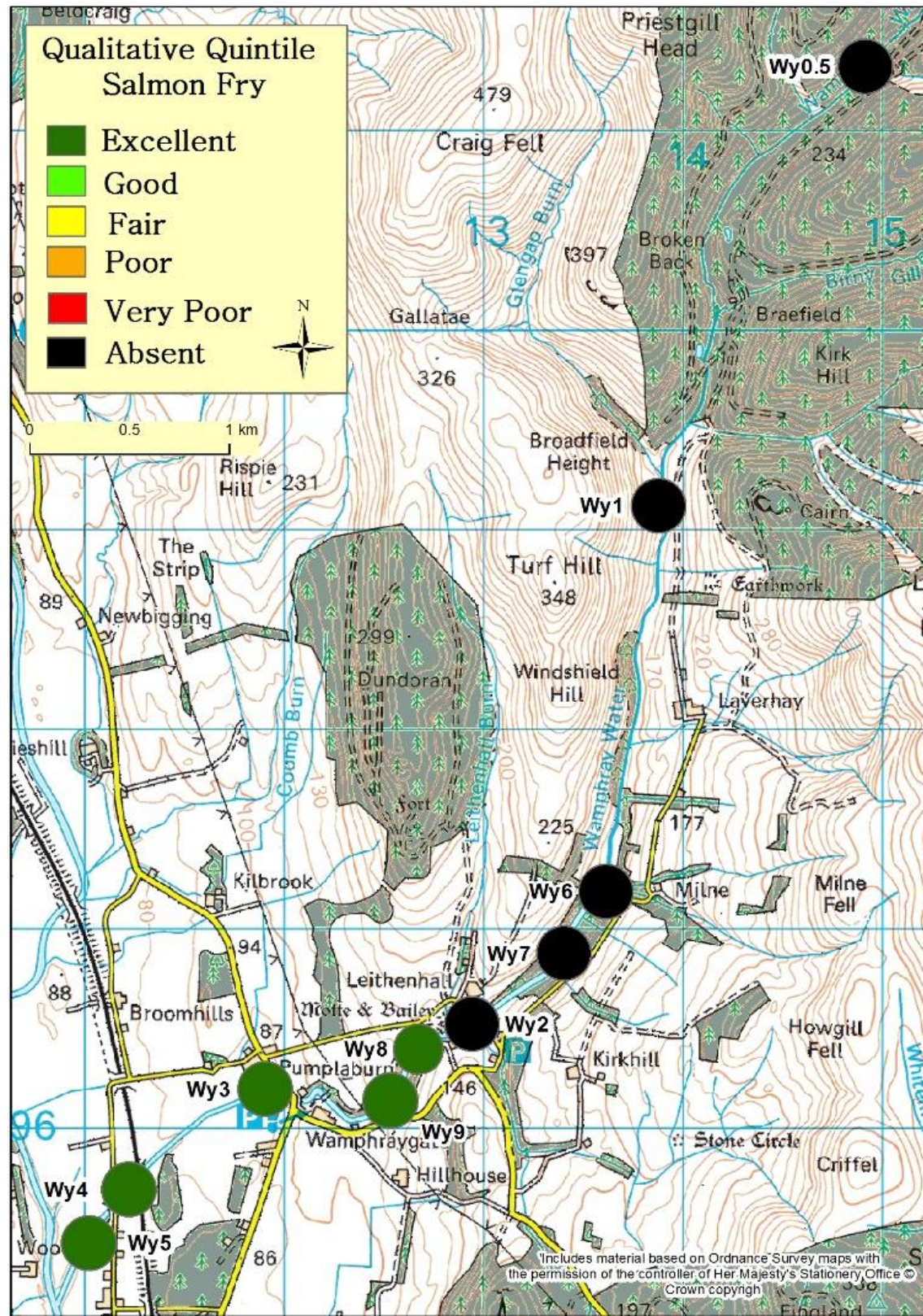


Figure 3 – Quintile Ranges for Salmon Parr Caught in 2018

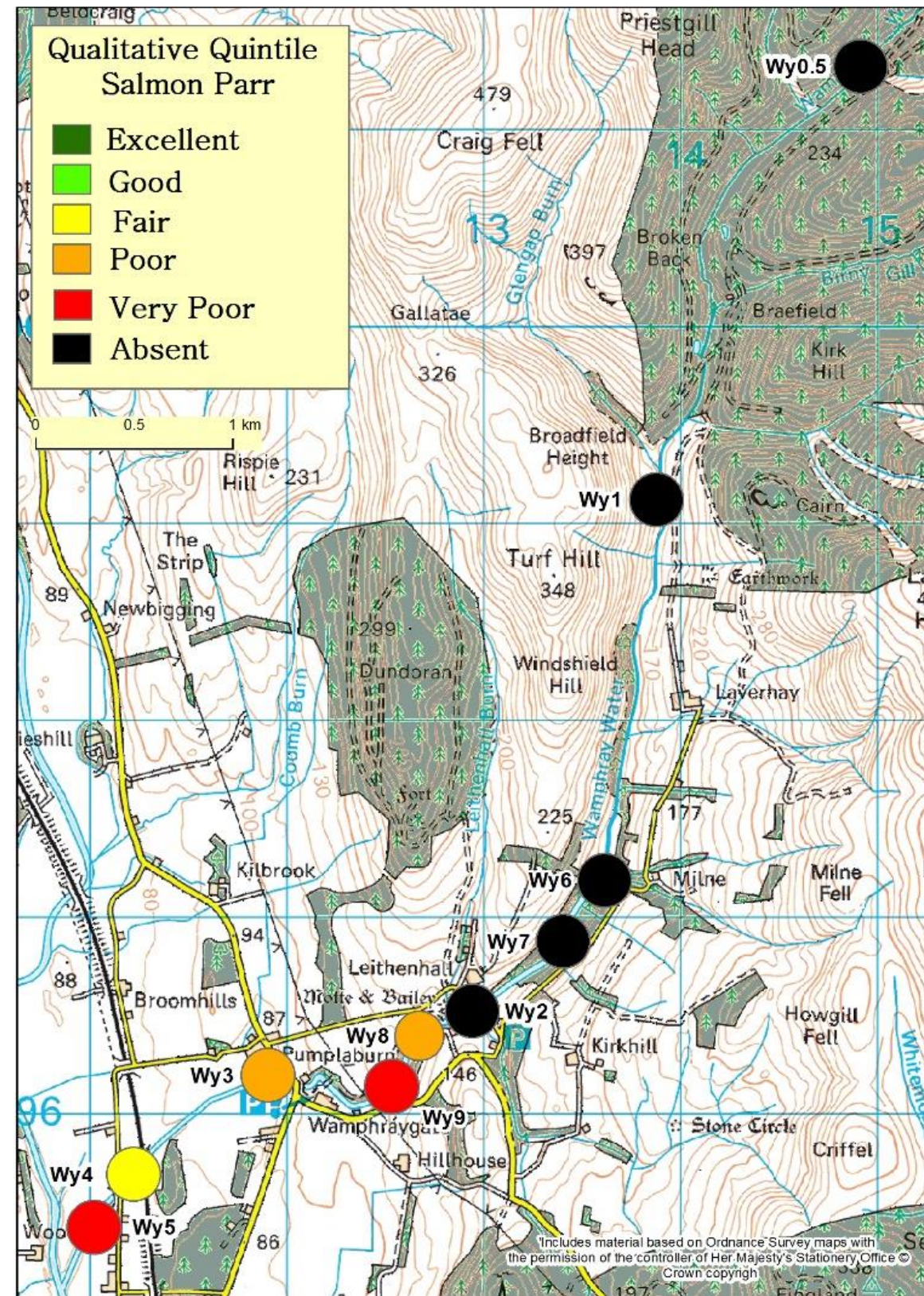




Figure 4 – Quintile Ranges for Trout Fry Caught in 2018

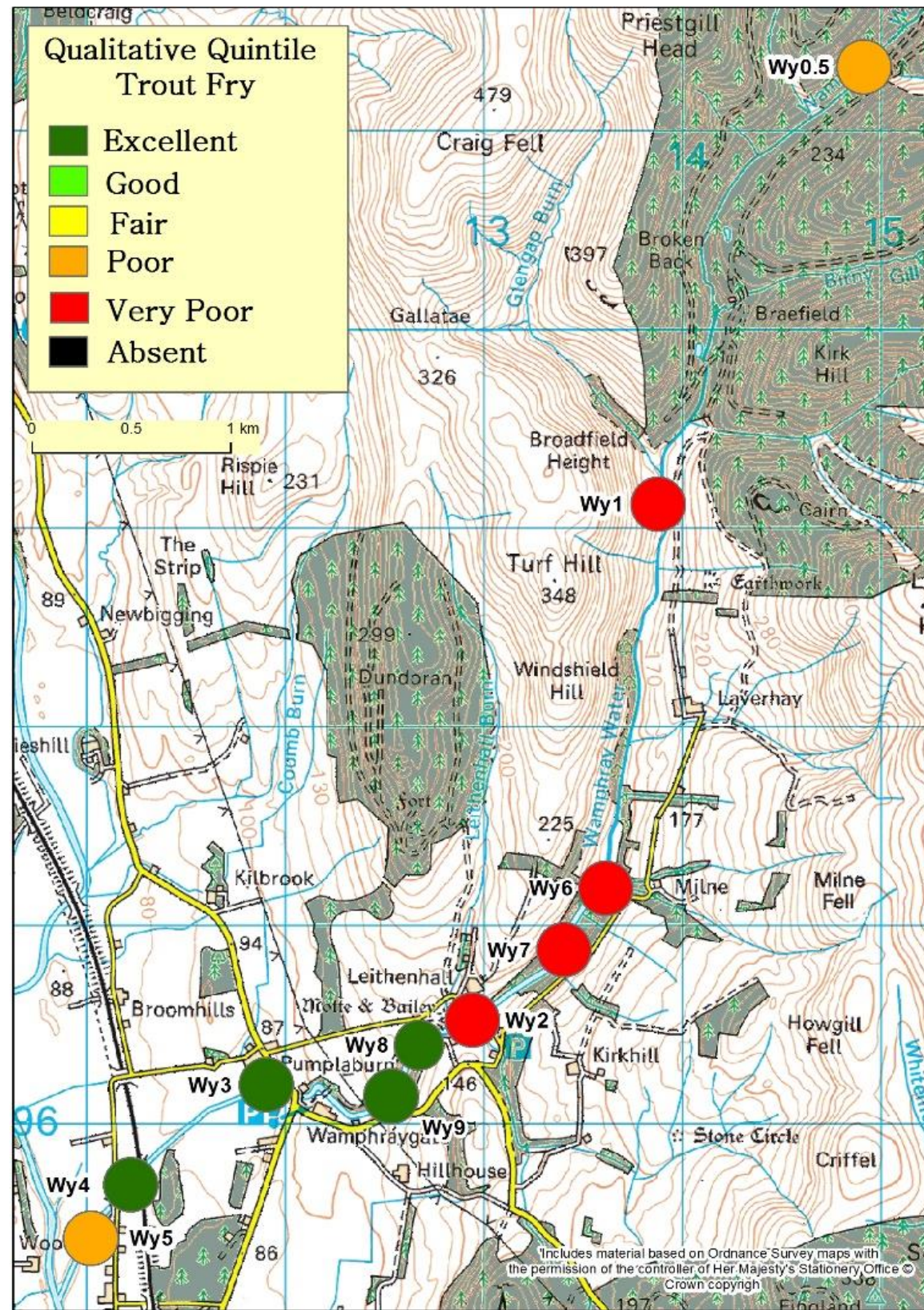


Figure 5 – Quintile Ranges for Trout Parr Caught in 2018

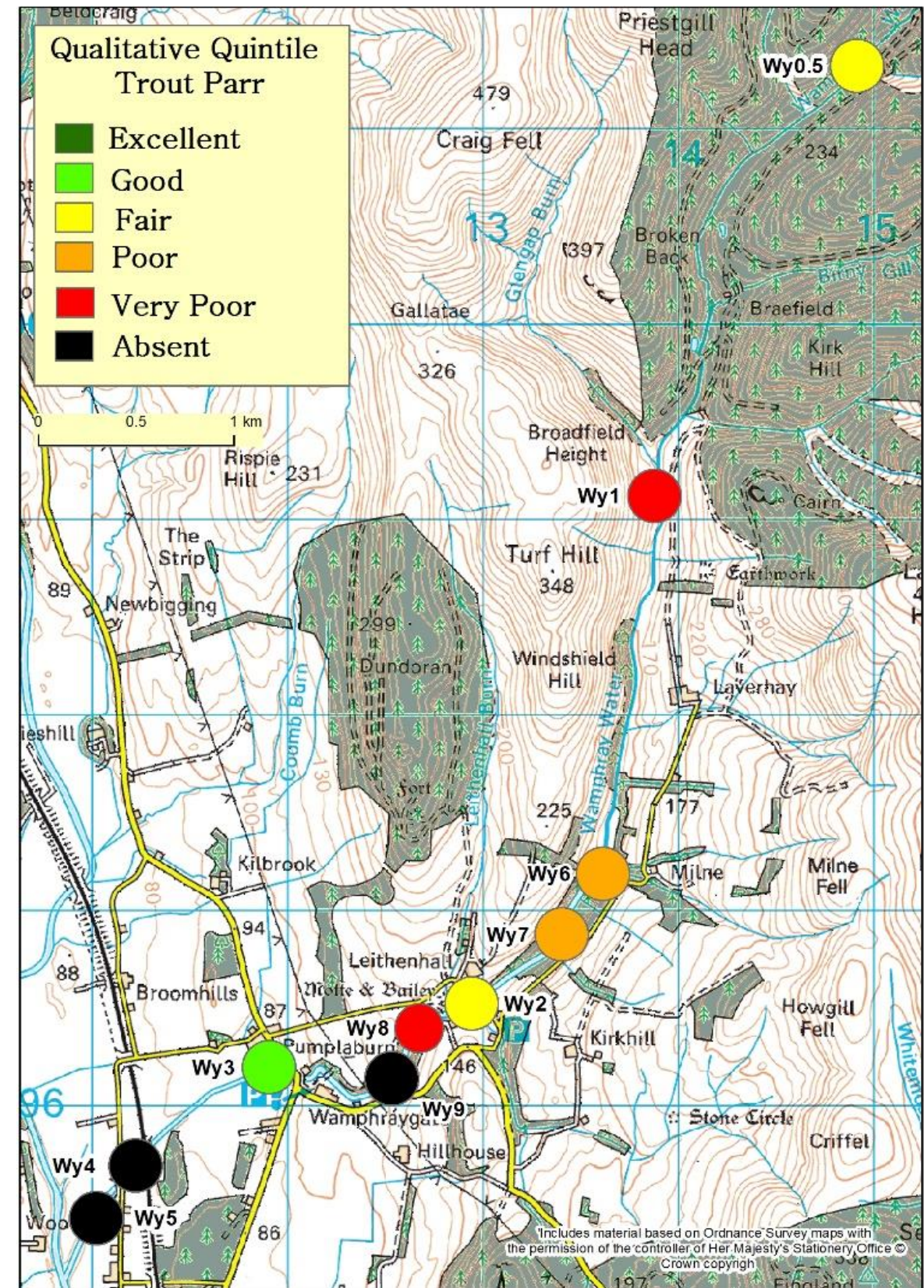




Figure 6 – Habitat Quality At All Sites in 2018

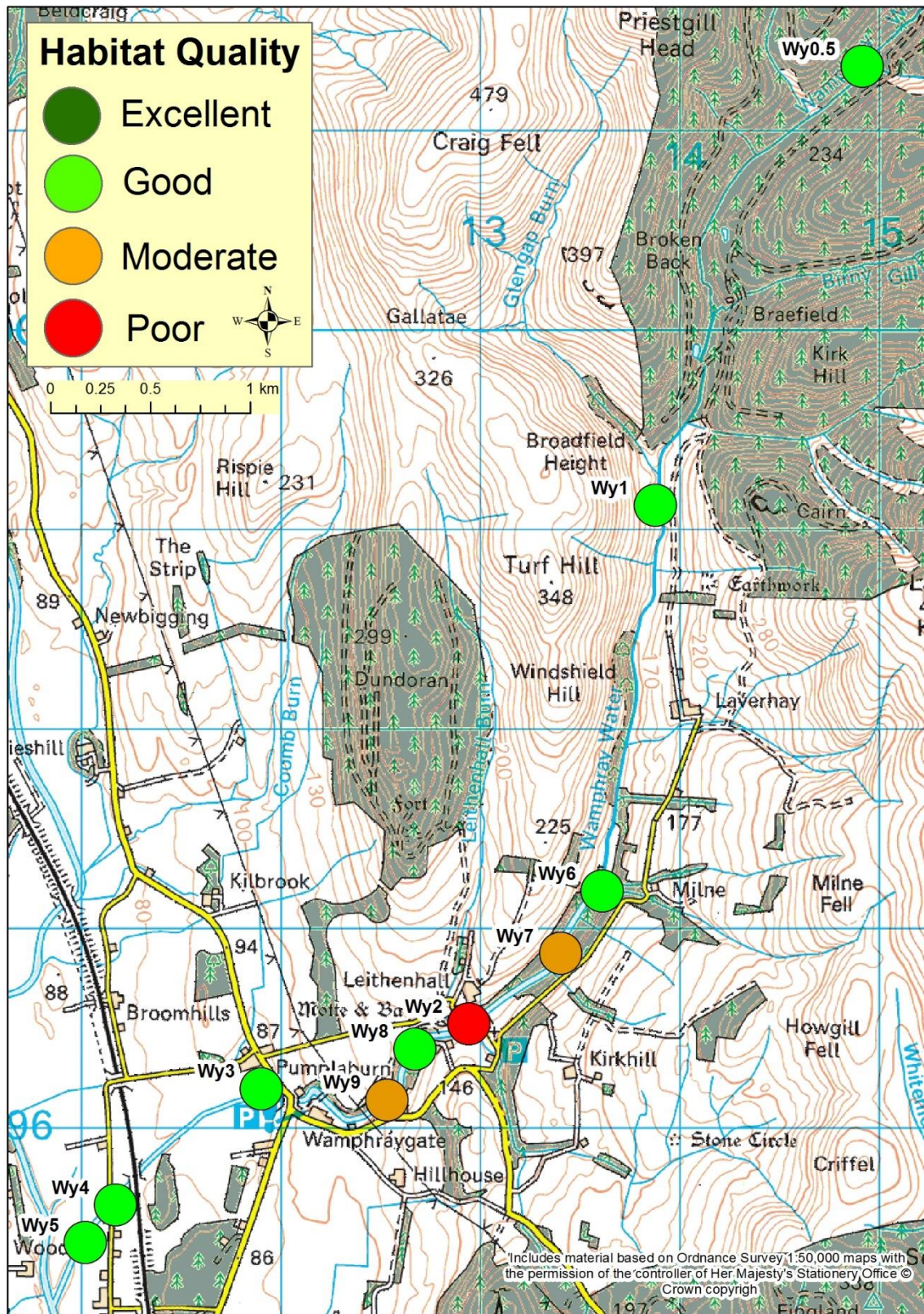
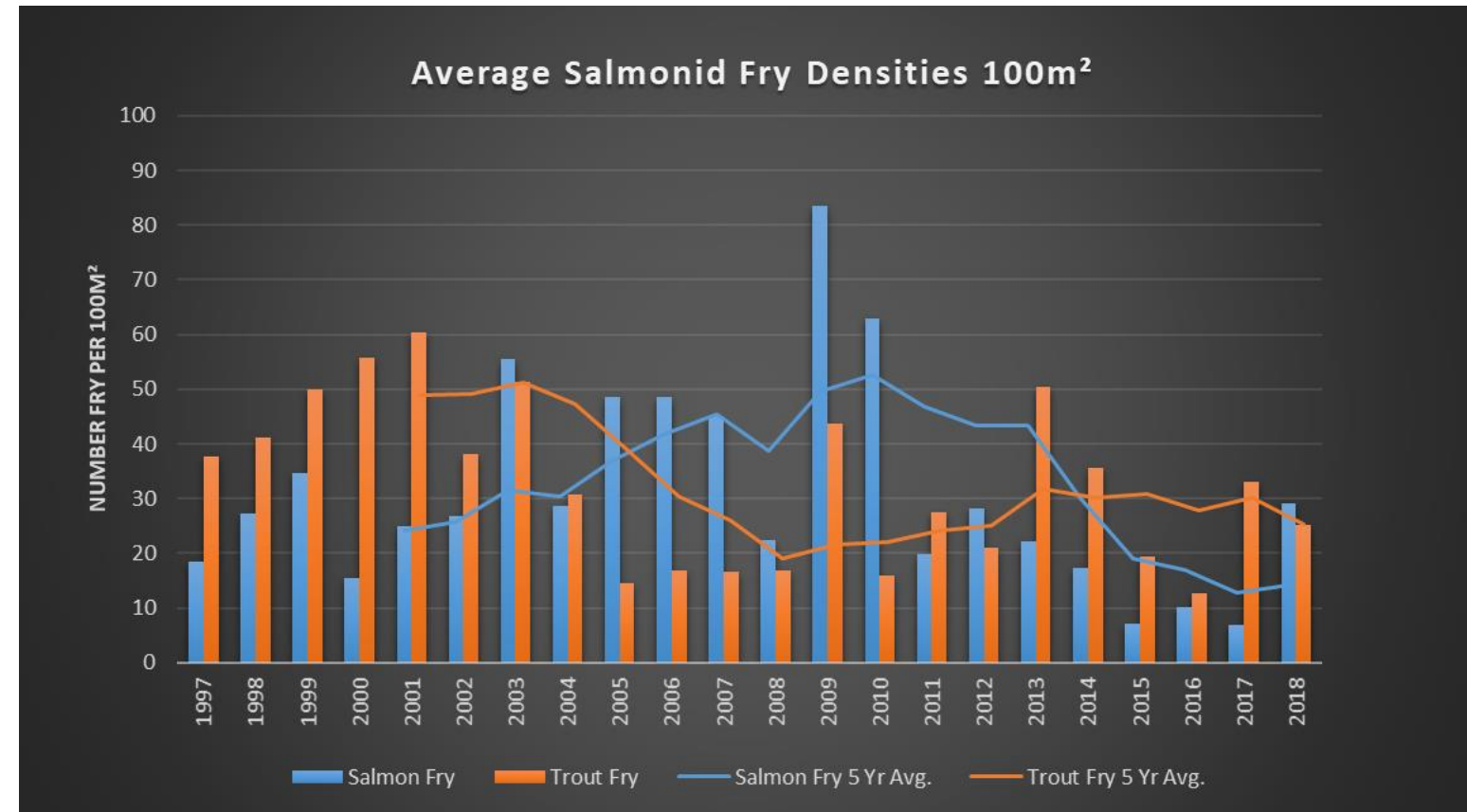


Figure 7 – Average Annual Salmon and Trout Fry Density Data Obtained from 1380 Electrofishing Surveys Conducted Between 1997 - 2018



### 5: Appendix

<b>Eastings:</b> 314926	<b>Northing:</b> 601326	<b>Site code:</b> Wy0.5	<b>Altitude:</b>
<b>River:</b> Wamphray Water			
<b>Site situation:</b> Start at confluence of burn from Ruegill Hill			
<b>Access/permission:</b>			<b>Date:</b> 06/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 3
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

#### Dimensions

<b>Wet Width Area (m<sup>2</sup>):</b> 114.6	<b>Site Length (m):</b> 30.0
<b>Bed Width Area (m<sup>2</sup>):</b> 127.2	
<b>Bank Width Area (m<sup>2</sup>):</b> 132.0	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		3.9		4.0		4.3	
B	7.5		4.2		4.3		4.3	
C	15.0		4.1		4.5		4.5	
D	22.5		3.9		3.9		3.9	
E-Downst	30.0		3.0		4.5		5.0	

#### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	30	20	10	10	0

#### Instream

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	10	20	30	30	10	0	0	100

#### Flow

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	10	10	10	20	20	20	10	100

#### Bank

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	0
<b>Bankface Veg.</b>	Uniform	Uniform
<b>Banktop Veg.</b>	Simple	Uniform
<b>Overhang Bough (%)</b>	10	0
<b>Canopy Cover (%)</b>	5	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

#### Other

<b>Team Leader:</b>	Tony Donnelly
<b>Number of Staff:</b>	3
<b>Survey Purpose:</b>	Monitoring
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	300
<b>Amps:</b>	0.2
<b>Smooth / Pulsed:</b>	Smooth
<b>Manufacturer:</b>	ElectraFish
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	80

<b>Temperature:</b>	12.00
<b>Time:</b>	11:00





<b>Eastings:</b> 313875	<b>Northings:</b> 599125	<b>Site code:</b> Wy1	<b>Altitude:</b> 170
<b>River:</b> Wamphray Water			
<b>Site situation:</b> Laverhay farm upstream thor beck downstream of chapple lea			
<b>Access/permission:</b> Left Bank: Laverhay Right Bank: Laverhay			<b>Date:</b> 06/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 1
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

<b>Wet Width Area (m²):</b> 53.0	<b>Site Length (m):</b> 11.2
<b>Bed Width Area (m²):</b> 60.9	
<b>Bank Width Area (m²):</b> 61.2	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	5.2	5.2	5.2	5.2
B	6.0	4.0	4.9	4.9	5.0
C-Downst	11.2	5.0	6.2	6.2	6.2

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	50	40	0	0	0

**Instream**

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	5	0	15	30	40	10	0	0	100

**Flow**

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total

0	0	0	0	20	65	15	0	100
---	---	---	---	----	----	----	---	-----

**Bank**

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	15
<b>Bankface Veg.</b>	Uniform	Complex
<b>Banktop Veg.</b>	Simple	Complex
<b>Overhang Bough (%)</b>	0	95
<b>Canopy Cover (%)</b>	10	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	15	100	85	0	0	0	0	0	0	0	0	100	100

**Other**

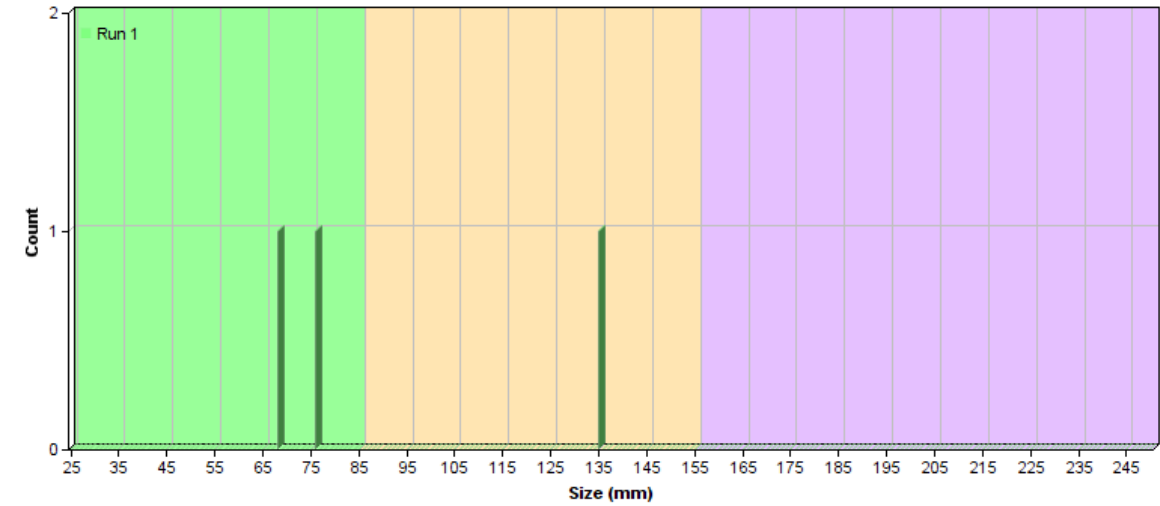
<b>Team Leader:</b>	Tony Donnelly
<b>Number of Staff:</b>	3
<b>Survey Purpose:</b>	Contract (Other than SAC or WFD)
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	310
<b>Amps:</b>	
<b>Smooth / Pulsed:</b>	Smooth
<b>Manufacturer:</b>	ElectraFish
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	

<b>Temperature:</b>	
<b>Time:</b>	
<b>Water Level:</b>	Medium
<b>Water Clarity:</b>	Clear
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Yes

<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	✓

**Other Fish Species Count**

Species	Count



**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	2	0	0	0	0	2			3.773	3.773	72	5.657	
1+	1	0	0	0	0	1			1.886	1.886	135		
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	3	0	0	0	0	3							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 313610	Northing: 597190	Site code: Wy6	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 06/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 100.2	Site Length (m): 15.6
Bed Width Area (m <sup>2</sup> ): 117.8	
Bank Width Area (m <sup>2</sup> ): 131.4	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.5		8.2		9.0	
B	5.2		6.3		7.0		7.5	
C	10.4		5.5		6.7		8.2	
D-Downst	15.6		7.4		8.3		9.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
60	40	0	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	35	50	5	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	70	20	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	10
Bankface Veg.	Uniform	Simple
Banktop Veg.	Uniform	Simple
Overhang Bough (%)	0	10
Canopy Cover (%)	10	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	10	100	90	0	0	0	10	0	0	0	0	100	110

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	15:00
Water Level:	Medium
Water Clarity:	Clear



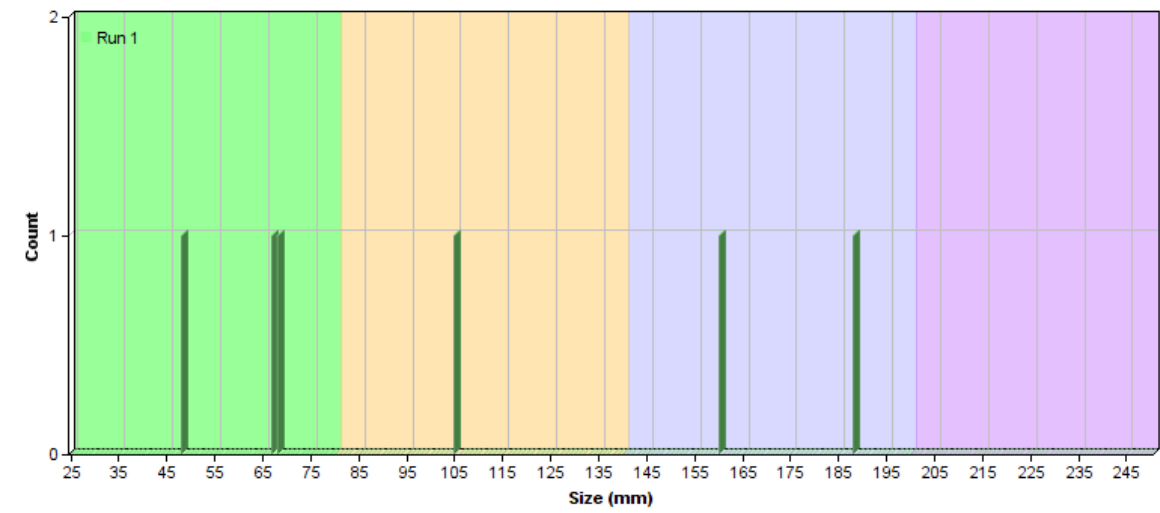
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<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

**Brown Trout (Sea Trout) Density Report**

- The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.



Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	3	0	0	0	0	3			2.993	2.993	61	11.269	
1+	1	0	0	0	0	1			0.998	0.998	105		
2+	2	0	0	0	0	2			1.995	1.995	174	19.799	
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	6	0	0	0	0	6							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 313400	Northing: 596880	Site code: Wy7	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 06/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

### Dimensions

Wet Width Area (m <sup>2</sup> ): 84.4	Site Length (m): 15.0
Bed Width Area (m <sup>2</sup> ): 105.8	
Bank Width Area (m <sup>2</sup> ): 123.8	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	5.3	6.8	8.0	
B	5.0	4.8	7.2	8.2	
C	10.0	6.4	7.5	8.4	
D-Downst	15.0	6.0	6.7	8.4	

### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	40	30	0	0	0

### Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Partly
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	5	15	30	40	10	0	0	100

### Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	30	70	0	0	100

### Bank

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Simple	Simple
Banktop Veg.	Simple	Complex
Overhang Bough (%)	100	100
Canopy Cover (%)	80	
Notes		

Undercut UC	Draped DR	Bare BA	Marginal MA	Roots RT	Rocks RK	Other OTH	Bank Total
LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	0	0	0	0
100	100	0	0	0	0	0	0
100	100						

### Other

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	13.50
Time:	16:00
Water Level:	Medium
Water Clarity:	Clear

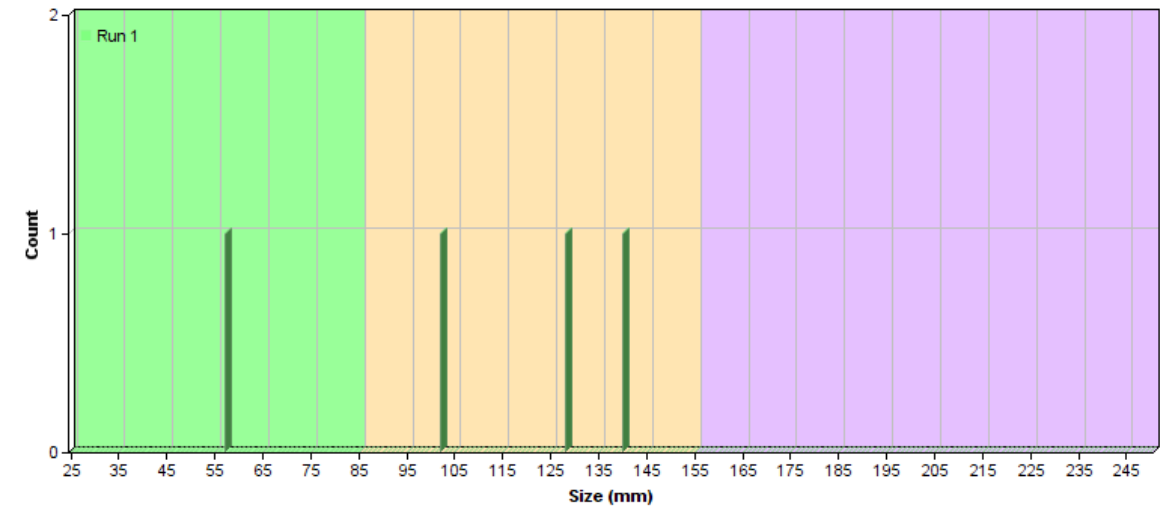
<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Unknown
<b>Trout Access:</b>	Don
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.



Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	1	0	0	0	0	1			1.185	1.185	57		
1+	3	0	0	0	0	3			3.555	3.555	123	19.425	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	4	0	0	0	0	4							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

Eastings: 312939	Northing: 596526	Site code: Wy2	Altitude: 100
River: Wamphray Water			
Site situation: first riffle d/s bridge at Leithenhall (top of site)			
Access/permission: Left Bank: Annan DSFB Right Bank: same			Date: 07/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Poor	Target Species: Atlantic Salmon (Salmo salar)

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 103.4	Site Length (m): 19.7
Bed Width Area (m <sup>2</sup> ): 146.8	
Bank Width Area (m <sup>2</sup> ): 161.1	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		5.8		6.9		7.0	
B	6.5		5.1		5.9		6.7	
C	13.0		5.2		6.8		8.0	
D-Downst	19.7		4.9		10.2		11.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
10	10	20	20	20	20

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Unstable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	10	10	10	10	0	60	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	15	15	40	20	10	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	20
Bankface Veg.	Bare	Complex
Banktop Veg.	Simple	Complex
Overhang Bough (%)	0	100
Canopy Cover (%)	50	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	20	0	0	100	80	0	0	0	20	0	0	0	0	100	120

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	310
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	110

Temperature:	14.00
Time:	14:00
Water Level:	Medium
Water Clarity:	Clear





Eastings: 312529	Northing: 596143	Site code: Wy9	Altitude:
River: Wamphray Water			
Site situation:			
Access/permission:		Date: 07/08/18	

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 1
Instream Cover: Moderate	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 65.8	Site Length (m): 14.0
Bed Width Area (m <sup>2</sup> ): 65.8	
Bank Width Area (m <sup>2</sup> ): 65.8	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0		6.3	6.3	6.3
B	3.0		5.7	5.7	5.7
C	7.0		5.1	5.1	5.1
D	10.0		3.6	3.6	3.6
E-Downst	14.0		2.8	2.8	2.8

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
30	40	20	10	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	50	30	0	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	10	90	0	0	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	0	0
Bankface Veg.	Simple	Uniform
Banktop Veg.	Simple	Uniform
Overhang Bough (%)	60	0
Canopy Cover (%)	40	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	3
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	130

Temperature:	14.00
Time:	11:00
Water Level:	Medium
Water Clarity:	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

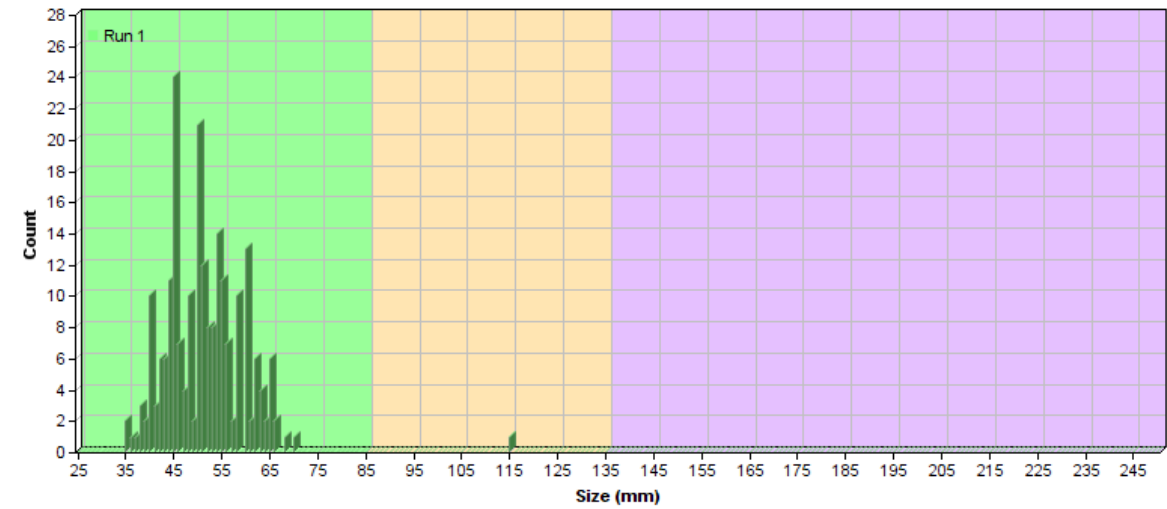
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?	
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev		
														0+
1+	1	0	0	0	0	1			1.520	1.520	115			
2+	0	0	0	0	0	0			NaN	NaN				
3+	0	0	0	0	0	0			NaN	NaN				
4++	0	0	0	0	0	0			0.000	0.000				
<b>Total</b>	<b>223</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>223</b>								
Salmon Missed						(NaN)								

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					

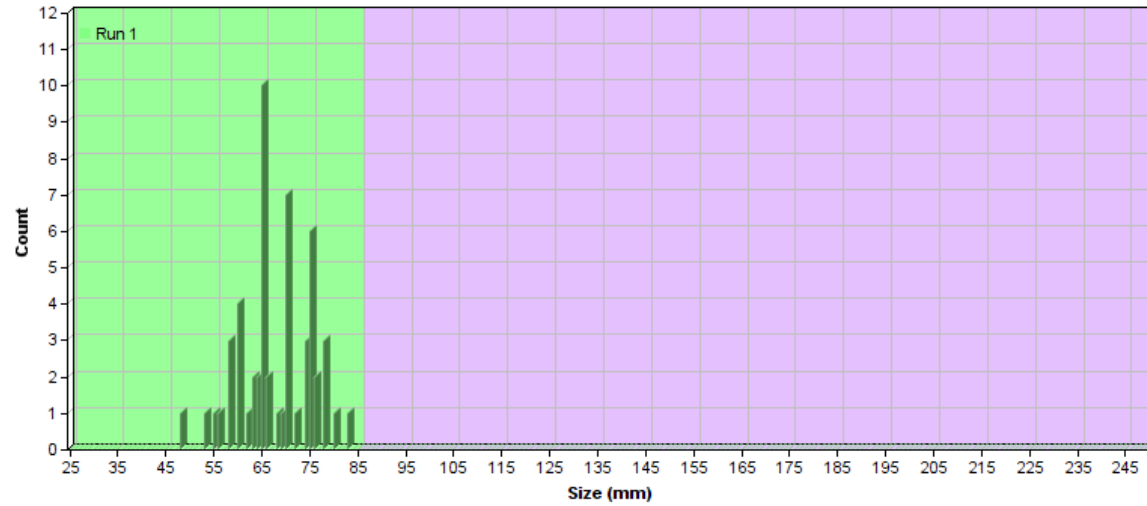


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?	
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev		
														0+
1+	0	0	0	0	0	0			NaN	NaN				
2+	0	0	0	0	0	0			NaN	NaN				
3+	0	0	0	0	0	0			NaN	NaN				
4++	0	0	0	0	0	0			0.000	0.000				
<b>Total</b>	<b>54</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>54</b>								
Trout Missed						(NaN)								

Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+						0+					
1+						1+					
2+						2+					
3+						3+					
4++						4++					



Eastings: 311900	Northing: 596200	Site code: Wy3	Altitude: 90
River: Wamphray Water			
Site situation: Below road bridge at Pumplaburn Farm			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 05/08/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

Wet Width Area (m <sup>2</sup> ): 112.1	Site Length (m): 15.2
Bed Width Area (m <sup>2</sup> ): 112.1	
Bank Width Area (m <sup>2</sup> ): 129.6	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		7.7		7.7		8.4	
B	5.0		5.9		5.9		9.0	
C	10.0		8.0		8.0		8.7	
D-Downst	15.2		7.9		7.9		8.0	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
80	20	0	0	0	0

**Instream**

Instream Vegetation (%): 0	Silted: No
----------------------------	------------

Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	15	25	50	10	0	0	100

**Flow**

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	20	70	10	0	100

**Bank**

	Left Bank	Right Bank
Total Fish Cover (%)	5	10
Bankface Veg.	Bare	Simple
Banktop Veg.	Simple	Complex
Overhang Bough (%)	10	10
Canopy Cover (%)	20	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	5	10	95	90	0	0	0	0	0	0	0	0	100	100

**Other**

Team Leader:	Tony Donnelly
Number of Staff:	6
Survey Purpose:	Monitoring
Purpose Notes:	
Equipment Type:	Backpack
Volts:	300
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish



Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	120

Temperature:	13.50
Time:	00:12
Water Level:	Medium
Water Clarity:	Clear
Survey Notes:	
Salmon Access:	Regularly
Trout Access:	Yes
Pollution:	No
Access Notes:	
Pollution Notes:	
Stocking:	No
Salmon Stocked:	No
Trout Stocked:	No
Stocking Notes:	
Photos and IDs:	<input checked="" type="checkbox"/>

**Other Fish Species Count**

Species	Count

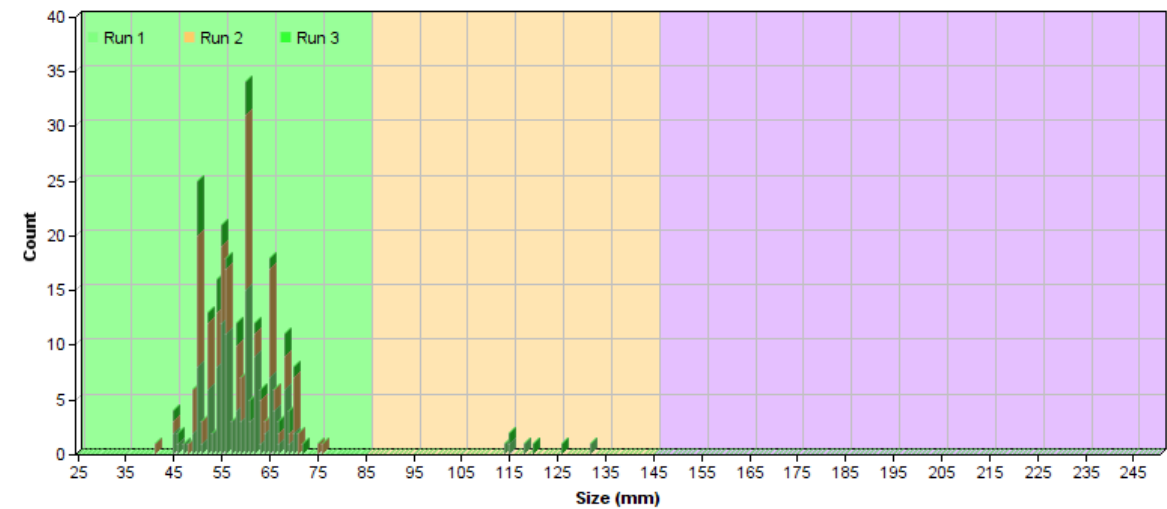
**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	115	104	31	0	0	250	281.026	276.539	102.587	223.015	58	6.572	
1+	4	0	3	0	0	7	13.108	6.244	3.568	6.244	120	6.708	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	119	104	34	0	0	257							

Salmon Missed	(NaN)
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Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	281.026	241.266	320.786	39.76	0.409	0+	276.539	241.069	312.009	35.47	0.419
1+	13.108	-28.002	54.218	41.11	0.194	1+	6.244	6.244	6.244	.	0.538
2+						2+					
3+						3+					
4++						4++					



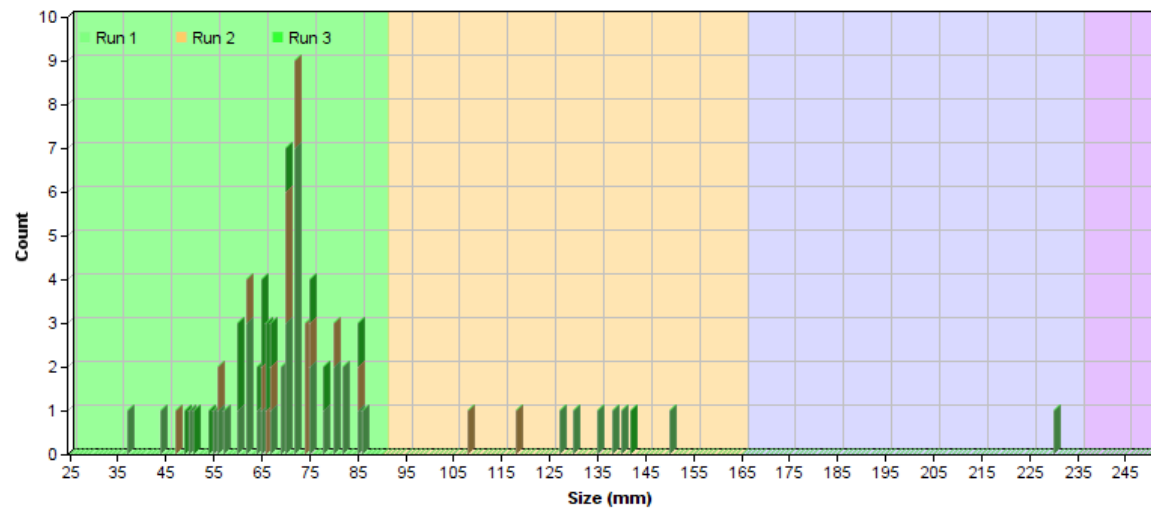
**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	34	17	15	0	0	66	79.927	74.933	30.330	58.876	67	10.253	
1+	6	2	1	0	0	9	8.514	8.029	5.352	8.029	132	12.913	
2+	1	0	0	0	0	1			0.892	0.892	230		
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	41	19	16	0	0	76							

Trout Missed	(NaN)
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Zippin					Carle & Strub						
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	79.927	50.978	108.876	28.949	0.359	0+	74.933	55.506	94.36	19.427	0.395
1+	8.514	6.452	10.576	2.062	0.615	1+	8.029	8.029	8.029	.	0.692
2+						2+					
3+						3+					
4++						4++					



Eastings: 311169	Northing: 595618	Site code: Wy4	Altitude: 70
River: Wamphray Water			
Site situation: d/s railway crossing, 50m u/s road bridge			
Access/permission: Left Bank: Annan DSFB Right Bank: Annan DSFB			Date: 09/09/18

Type of fishing: Quantitative (1mm)	Number of Fishing Runs: 3
Instream Cover: Good	Target Species: Atlantic Salmon ( <i>Salmo salar</i> )

### Dimensions

Wet Width Area (m <sup>2</sup> ): 100.6	Site Length (m): 25.0
Bed Width Area (m <sup>2</sup> ): 176.9	
Bank Width Area (m <sup>2</sup> ): 221.9	

Point No.	Measured (m)	At (m)	Wet Width (m)	Bed Width (m)	Bank Width (m)
A-Upst	0.0	4.3	6.6	8.4	
B	8.0	4.2	6.5	8.7	
C	16.0	4.0	6.9	8.8	
D-Downst	25.0	3.6	8.3	9.6	

### Depth

< 10	11-20	21-30	31-40	41-50	> 50
30	30	40	0	0	0

### Instream

Instream Vegetation (%): 0	Silted: No
Stable: Stable	Compacted: Uncompacted
Notes:	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	20	30	35	15	0	0	100

### Flow

Flow Speed (m/s):
Notes:

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	0	0	30	40	30	0	100

### Bank

	Left Bank	Right Bank
Total Fish Cover (%)	10	100
Bankface Veg.	Uniform	Bare
Banktop Veg.	Simple	Uniform
Overhang Bough (%)	0	0
Canopy Cover (%)	0	
Notes		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	50	10	0	90	0	0	0	0	0	0	100	0	0	100	150

### Other

Team Leader:	Chris Stones
Number of Staff:	4
Survey Purpose:	Contract (Other than SAC or WFD)
Purpose Notes:	
Equipment Type:	Backpack
Volts:	280
Amps:	0.5
Smooth / Pulsed:	Smooth
Manufacturer:	ElectraFish
Model:	
No. of Anodes:	1
Ring Diameter:	25.00
Stop Net:	Both Boundaries
Capture Net:	Combination
Effective Fishing:	Yes
Conductivity:	

Temperature:	
Time:	10:00
Water Level:	Medium
Water Clarity:	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

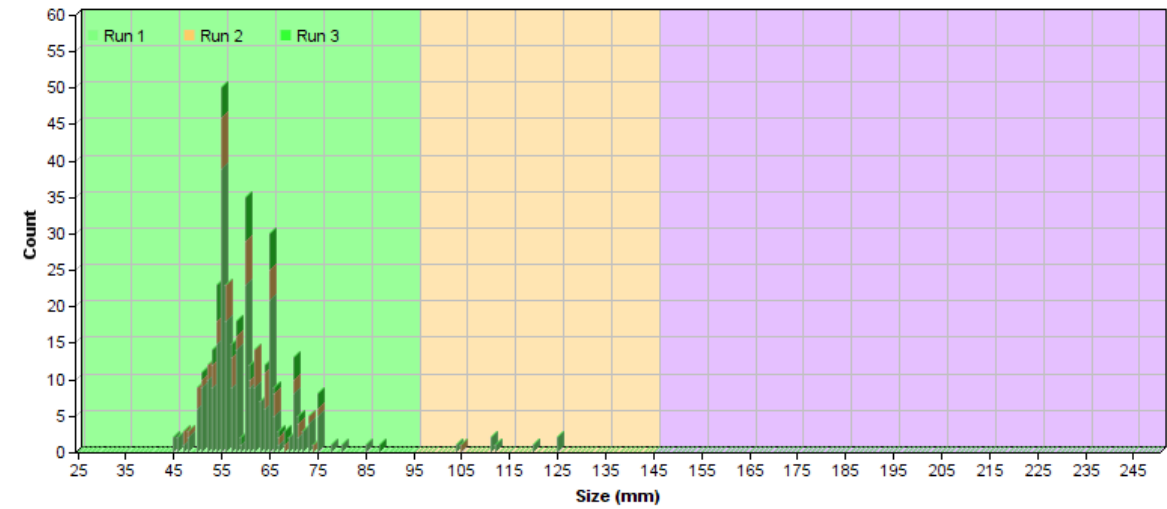
Species	Count

**Atlantic Salmon Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	245	66	42	0	0	353	369.189	367.684	243.466	350.790	59	6.906	
1+	7	1	0	0	0	8	7.962	7.95	6.956	7.950	114	8.288	
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	252	67	42	0	0	361							
Salmon Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	369.189	356.264	382.114	12.925	0.632	0+	367.684	355.719	379.649	11.965	0.637
1+	7.962	7.731	8.193	0.231	0.885	1+	7.95	7.95	7.95	.	0.889
2+						2+					
3+						3+					
4++						4++					



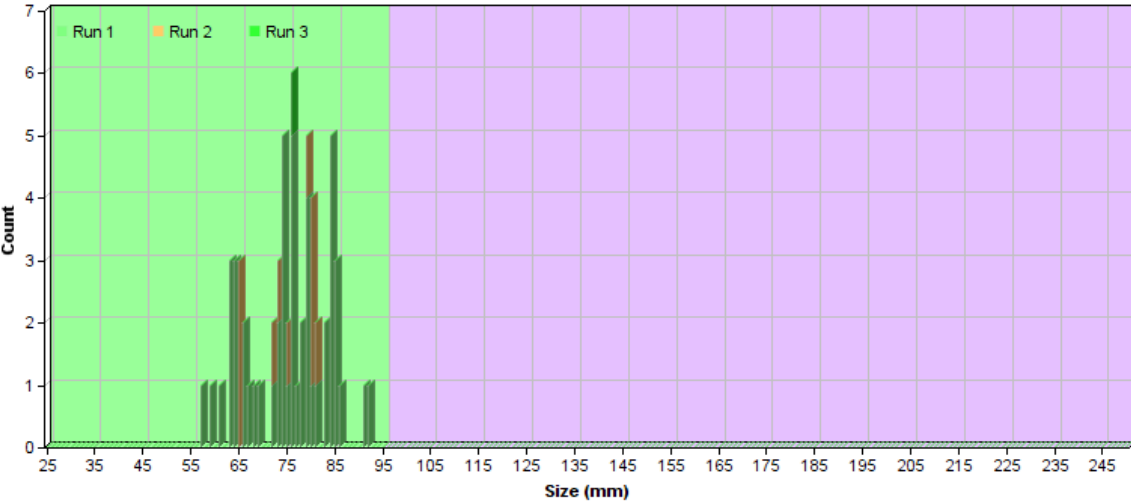
**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	50	11	1	0	0	62	62.017	61.612	49.687	61.612	75	8.121	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
Total	50	11	1	0	0	62							
Trout Missed						(NaN)							

Zippin						Carle & Strub					
Age	Estimate	Confidence Levels			Probability	Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%				Lower	Upper	95%	
0+	62.017	60.583	63.451	1.434	0.813	0+	61.612	61.612	61.612	.	0.827
1+						1+					
2+						2+					
3+						3+					
4++						4++					





**SFCC Electrofishing Event Report**

<b>Easting:</b> 311017	<b>Northing:</b> 595428	<b>Site code:</b> Wy5	<b>Altitude:</b>
<b>River:</b> Wamphray Water			
<b>Site situation:</b> 150 metres D/s of road bridge			
<b>Access/permission:</b>			<b>Date:</b> 09/08/18

<b>Type of fishing:</b> Quantitative (1mm)	<b>Number of Fishing Runs:</b> 3
<b>Instream Cover:</b> Good	<b>Target Species:</b> Atlantic Salmon ( <i>Salmo salar</i> )

**Dimensions**

<b>Wet Width Area (m<sup>2</sup>):</b> 96.4	<b>Site Length (m):</b> 16.0
<b>Bed Width Area (m<sup>2</sup>):</b> 147.6	
<b>Bank Width Area (m<sup>2</sup>):</b> 208.8	

Point No.	Measured (m)	At	Wet (m)	Width	Bed (m)	Width	Bank (m)	Width
A-Upst	0.0		6.1		12.4		13.8	
B	5.0		6.0		9.2		12.6	
C	10.0		6.0		7.8		13.0	
D-Downst	16.0		6.0		7.5		12.8	

**Depth**

< 10	11-20	21-30	31-40	41-50	> 50
80	20	0	0	0	0

**Instream**

<b>Instream Vegetation (%):</b> 0	<b>Silted:</b> No
<b>Stable:</b> Stable	<b>Compacted:</b> Uncompacted
<b>Notes:</b>	

High Organic HO	Silt SI	Sand SA	Gravel GR	Pebble PE	Cobble CO	Boulder BO	Bedrock BE	Obscured OB	Substrate Total
0	0	0	10	30	50	10	0	0	100

**Flow**

<b>Flow Speed (m/s):</b>
<b>Notes:</b>

Still Marginal SM	Deep Pool DP	Shallow Pool SP	Deep Glide DG	Shallow Glide SG	Run RU	Riffle RI	Torrent TO	Flow Total
0	0	10	0	30	45	15	0	100

**Bank**

	Left Bank	Right Bank
<b>Total Fish Cover (%)</b>	0	60
<b>Bankface Veg.</b>	Uniform	Uniform
<b>Banktop Veg.</b>	Uniform	Simple
<b>Overhang Bough (%)</b>	0	20
<b>Canopy Cover (%)</b>	0	
<b>Notes</b>		

Undercut UC		Draped DR		Bare BA		Marginal MA		Roots RT		Rocks RK		Other OTH		Bank Total	
LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB	LB	RB
0	0	0	60	100	40	0	0	0	0	0	0	0	0	100	100

**Other**

<b>Team Leader:</b>	Chris Stones
<b>Number of Staff:</b>	4
<b>Survey Purpose:</b>	Contract (Other than SAC or WFD)
<b>Purpose Notes:</b>	
<b>Equipment Type:</b>	Backpack
<b>Volts:</b>	300
<b>Amps:</b>	0.5
<b>Smooth Pulsed:</b>	Smooth /
<b>Manufacturer:</b>	
<b>Model:</b>	
<b>No. of Anodes:</b>	1
<b>Ring Diameter:</b>	25.00
<b>Stop Net:</b>	Both Boundaries
<b>Capture Net:</b>	Combination
<b>Effective Fishing:</b>	Yes
<b>Conductivity:</b>	

<b>Temperature:</b>	
<b>Time:</b>	13:30
<b>Water Level:</b>	Medium
<b>Water Clarity:</b>	Clear

<b>Survey Notes:</b>	
<b>Salmon Access:</b>	Regularly
<b>Trout Access:</b>	Yes
<b>Pollution:</b>	No
<b>Access Notes:</b>	
<b>Pollution Notes:</b>	
<b>Stocking:</b>	No
<b>Salmon Stocked:</b>	No
<b>Trout Stocked:</b>	No
<b>Stocking Notes:</b>	
<b>Photos and IDs:</b>	<input checked="" type="checkbox"/>

**Other Fish Species Count**

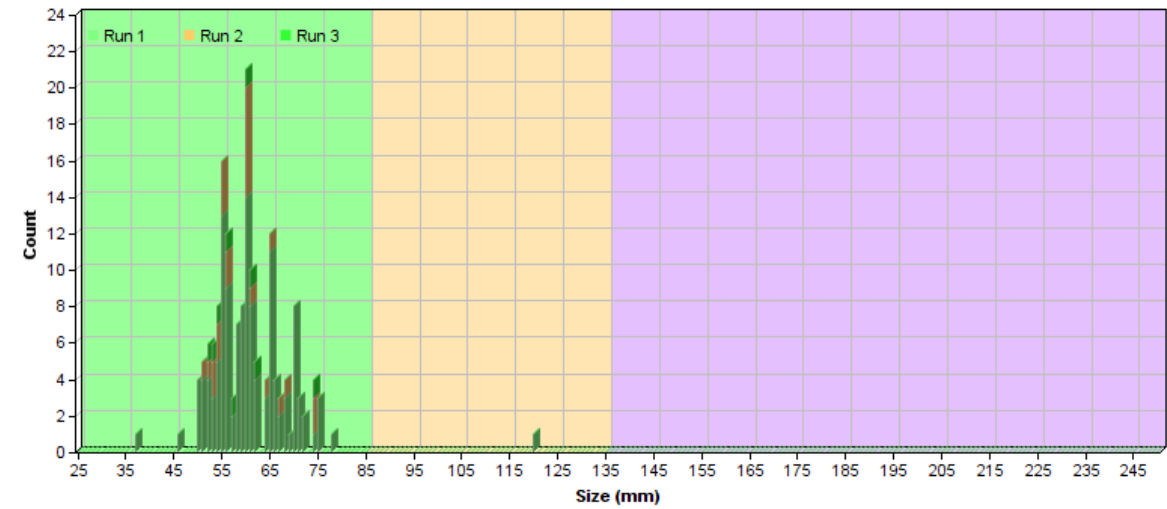
Species	Count

**Atlantic Salmon Density Report**

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Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	129	24	9	0	0	162	170.065	169.087	133.817	168.050	60	6.782	
1+	1	0	0	0	0	1			1.037	1.037	120		
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>130</b>	<b>24</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>163</b>							
Salmon Missed						(NaN)							

Zippin						Carle & Strub						
Age	Estimate	Confidence Levels			Probability		Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%					Lower	Upper	95%	
0+	170.065	166.623	173.507	3.442	0.772	0+	169.087	166.82	171.354	2.267	0.783	
1+						1+						
2+						2+						
3+						3+						
4++						4++						

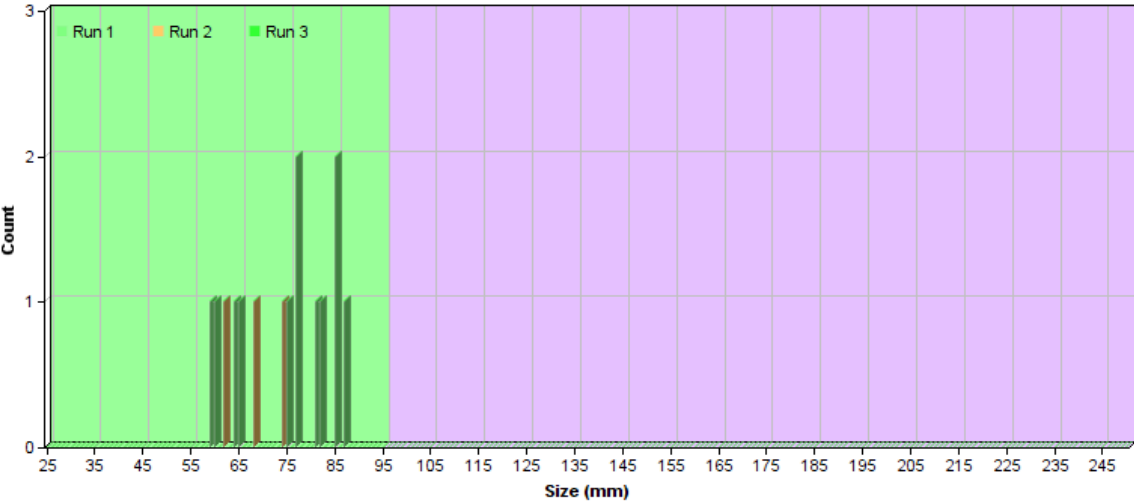


**Brown Trout (Sea Trout) Density Report**

• The SFCC gratefully acknowledge the use of REMOVE software and its associated code, written by Professor Ralph Clarke, Centre for Conservation Ecology and Environmental Change, Bournemouth University, for the calculation of Zippin and Carle and Strub density estimates.

Age	Counts						Density Estimate (per 100m <sup>2</sup> )		Minimum Estimate (per 100m <sup>2</sup> )		Length		Scales Read?
	R1	R2	R3	R4	R5	Total	Zippin	Carle & Strub	1 Run	All Runs	Average	Std Dev	
0+	12	3	0	0	0	15	15.65	15.56	12.448	15.560	73	9.709	
1+	0	0	0	0	0	0			NaN	NaN			
2+	0	0	0	0	0	0			NaN	NaN			
3+	0	0	0	0	0	0			NaN	NaN			
4++	0	0	0	0	0	0			0.000	0.000			
<b>Total</b>	<b>12</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>							
Trout Missed						(NaN)							

Zippin						Carle & Strub						
Age	Estimate	Confidence Levels			Probability		Age	Estimate	Confidence Levels			Probability
		Lower	Upper	95%					Lower	Upper	95%	
0+	15.65	14.967	16.333	0.683	0.821	0+	15.56	15.56	15.56	.	0.833	
1+						1+						
2+						2+						
3+						3+						
4++						4++						





# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Survey Areas

Notes: N/A  
Revisions: N/A

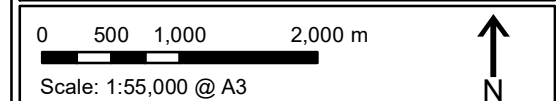
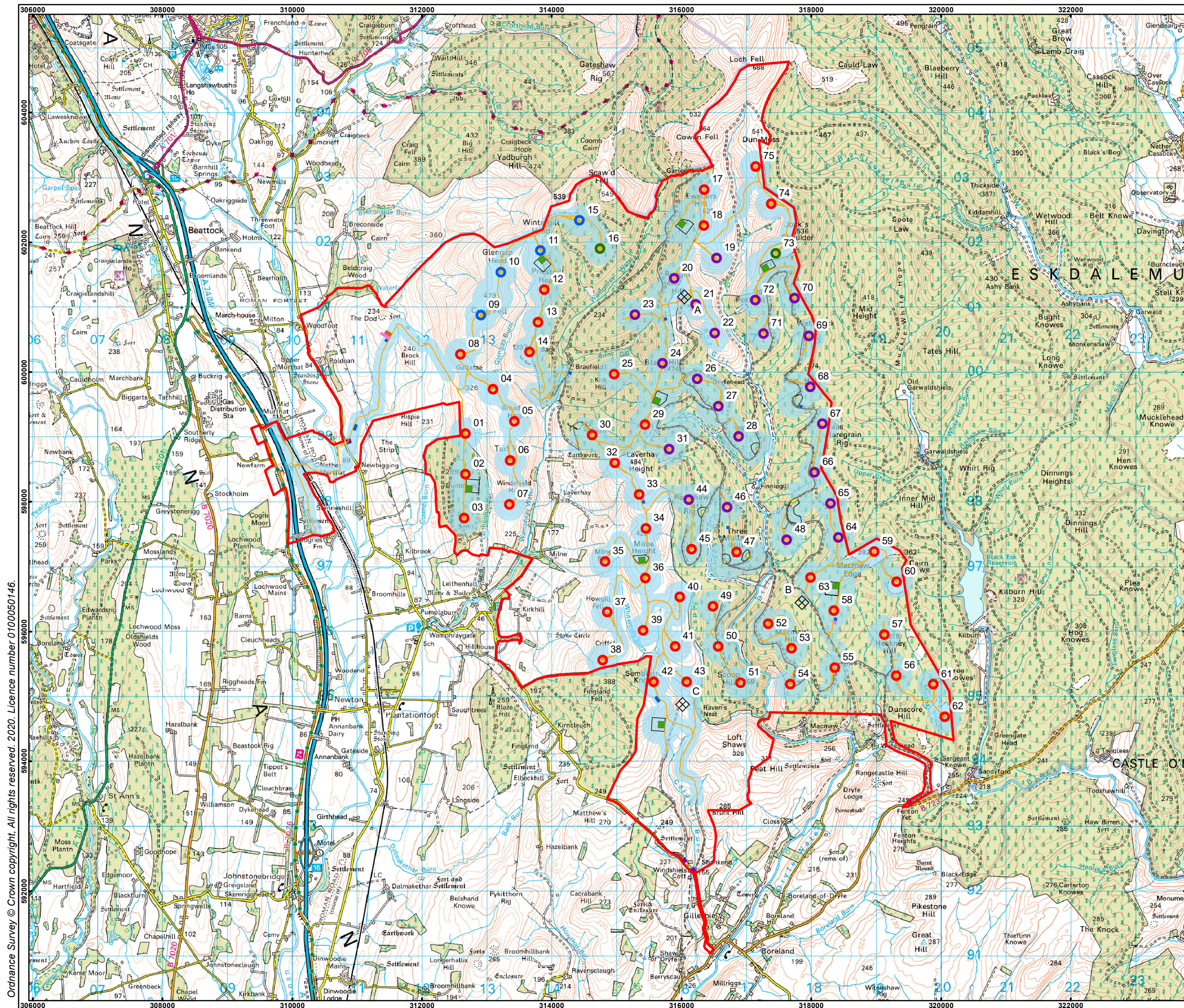


Figure 8.1 - Survey Areas

Date: 07/08/2020 Ref: 374-200807-7399-B  
Produced: DR Reviewed: SM Approved: GC

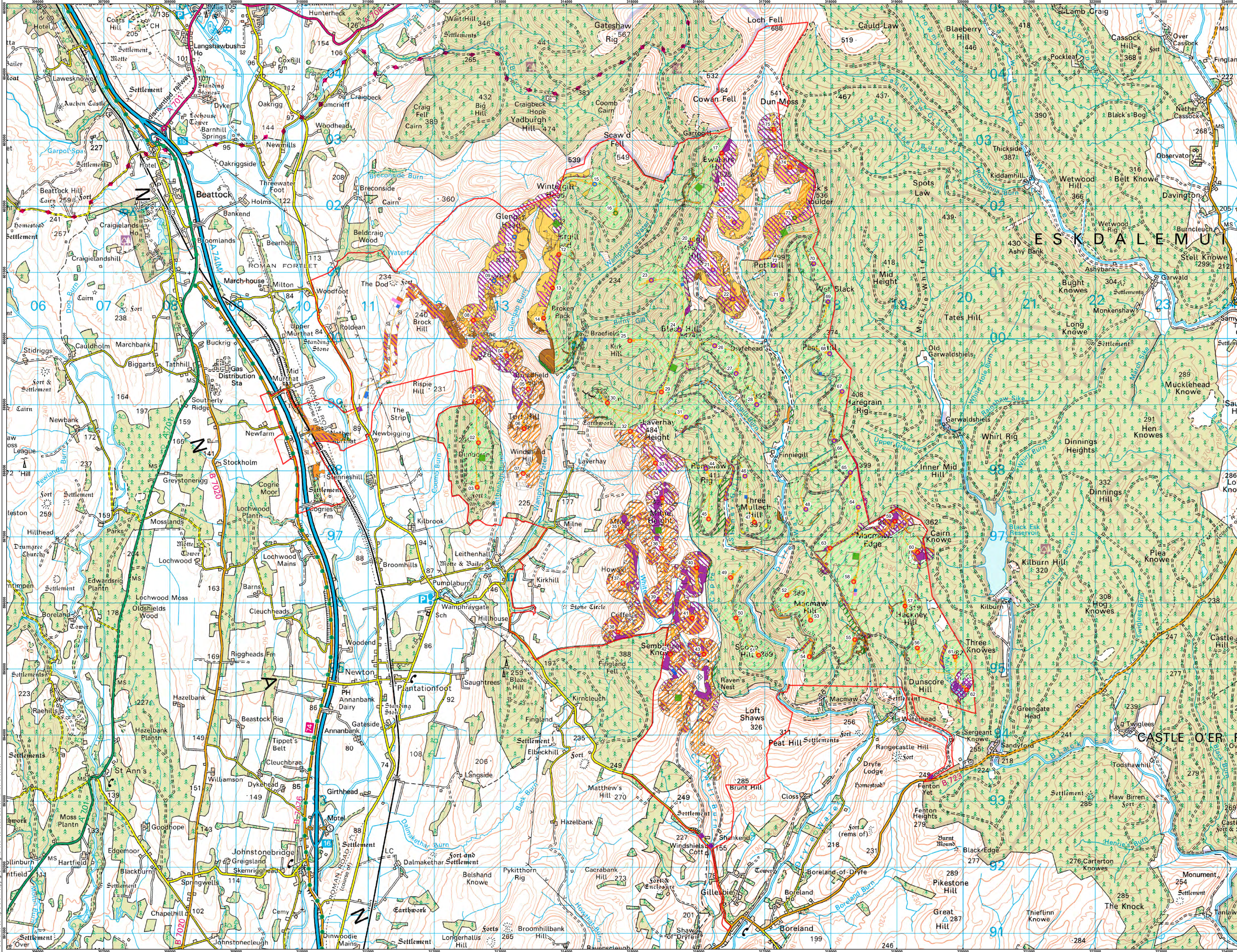
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- Legend**
- Site Boundary
  - Wind Turbine (180m to tip)
  - Wind Turbine (200m to tip)
  - Wind Turbine (225m to tip)
  - Wind Turbine (250m to tip)
  - Permanent Met Masts
  - Access Tracks
  - Site Entrance
  - Existing Access Tracks to be Upgraded
  - Substation & Control Room
  - Substation & Control Room Construction Compound
  - Temporary Construction Compound
  - Borrow Pit
  - Existing Quarries or Borrow Pit
  - Borrow Pit Area of
- Phase 1 Habitat Survey**
- A1.1.1
  - A1.1.2
  - A1.2.2
  - A1.3.2
  - A2.1
  - A4.2
  - B1.1
  - B1.2
  - B2.1
  - B2.2
  - B4
  - B5
  - B6
  - C1.1
  - C3.1
  - D1.1
  - D2
  - D5
  - D6
  - E1.6.1
  - E1.7
  - E2.1
  - F1
  - G1
  - I1.1.1
  - I1.2.1
  - J1.3
  - J4



Notes: N/A  
Revisions: N/A

0 250 500 1,000 m  
Scale: 1:25,000 @ A1

**Figure 8.2 - Phase 1 Habitat Survey**  
Date: 27/07/2020 Ref: 374-200727-7362-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target note

Notes: N/A  
Revisions: N/A

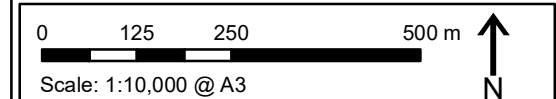


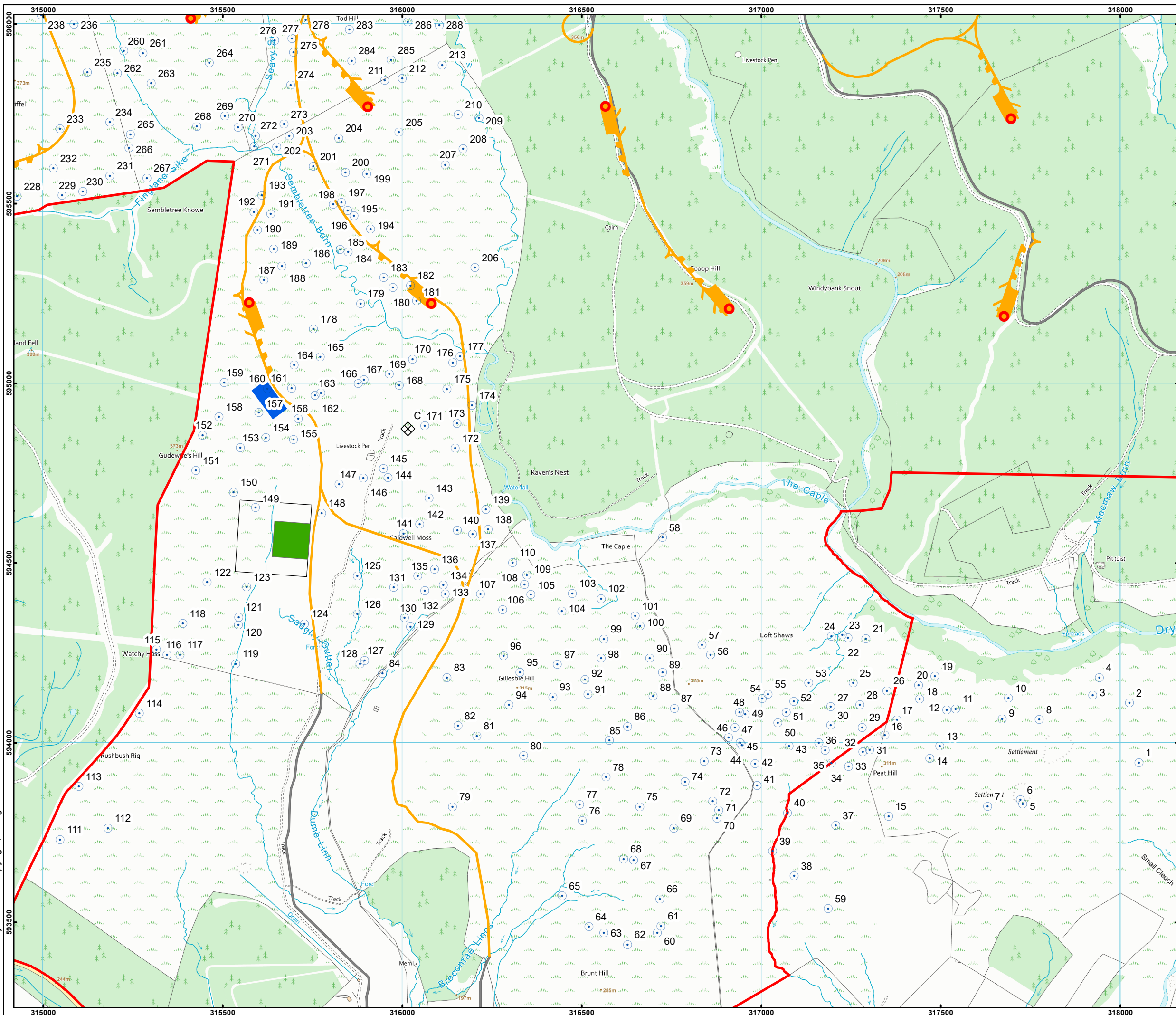
Figure 8.3a - Target notes for main central area with Laverhay Height and Milne Height

Date: 06/08/2020      Ref: 374-200806-7388-B  
Produced: DR      Reviewed: SM      Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

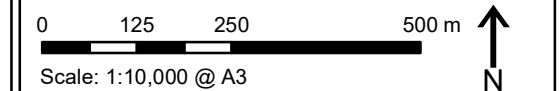
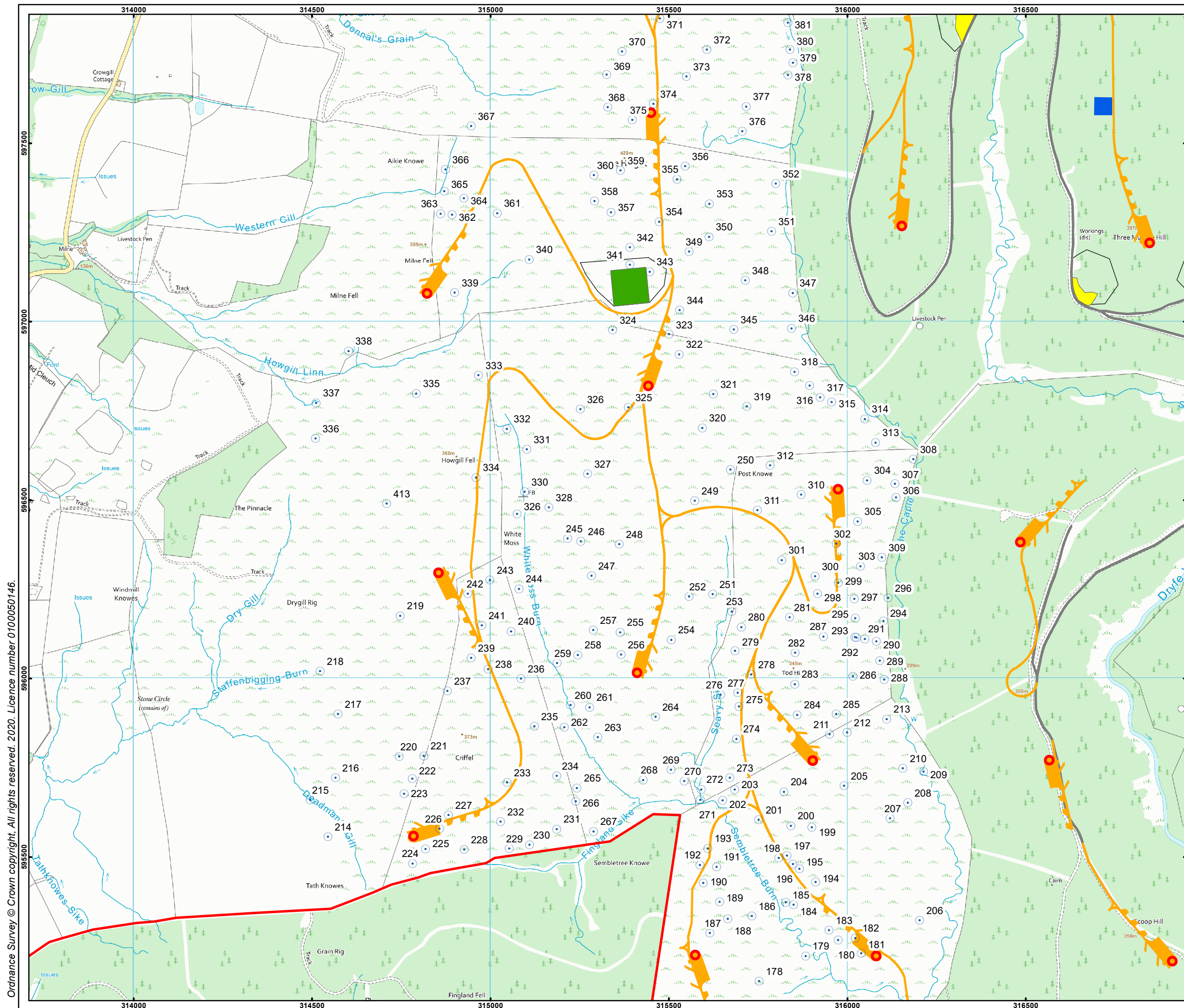


Figure 8.3b - Target notes for main central area with Laverhay Height and Milne Height

Date: 06/08/2020      Ref: 374-200806-7389-B  
Produced: DR      Reviewed: SM      Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target note

Notes: N/A  
Revisions: N/A

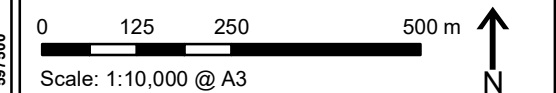
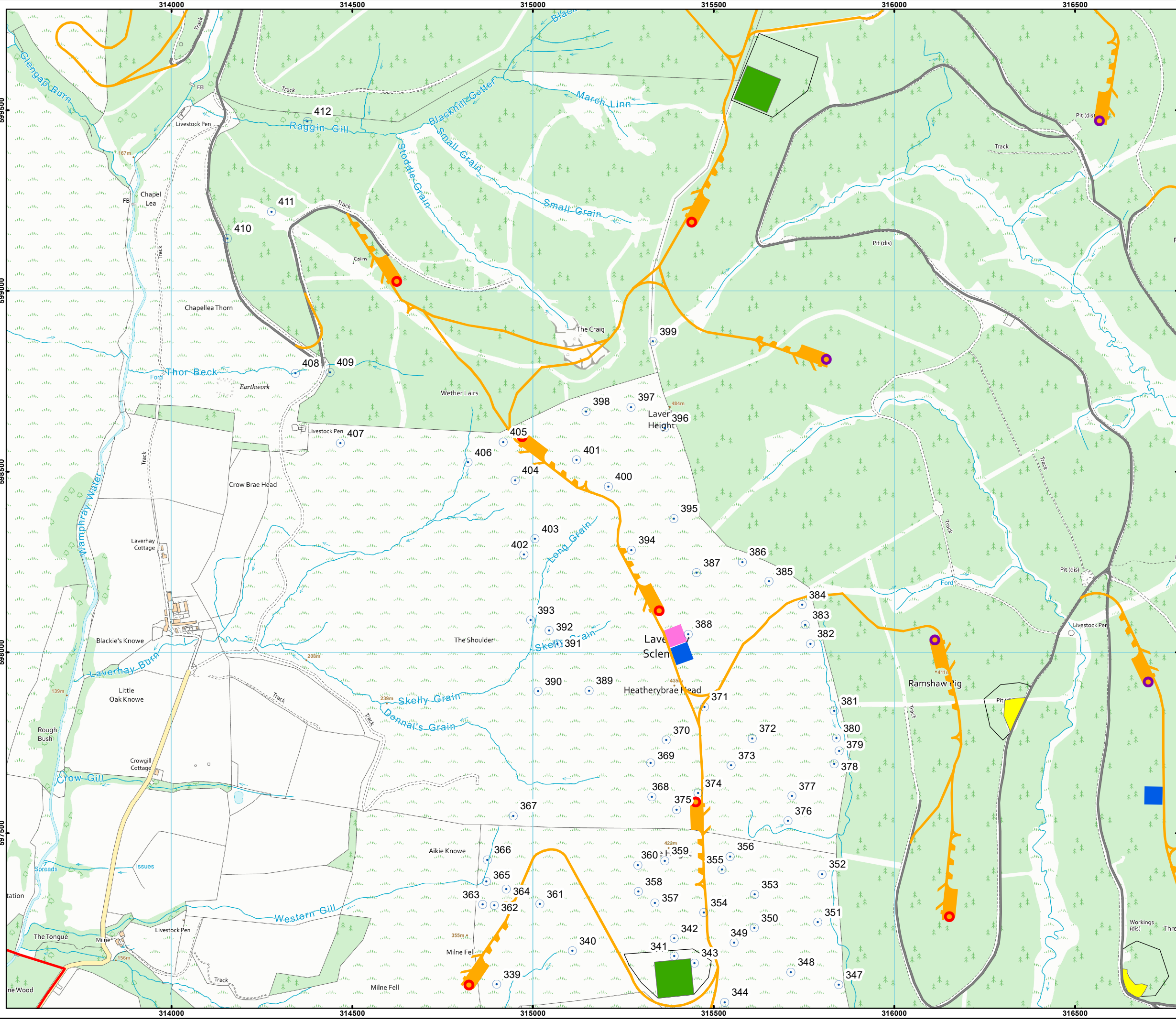


Figure 8.3c - Target notes for main central area with Laverhay Height and Milne Height

Date: 06/08/2020 Ref: 374-200806-7390-B  
Produced: DR Reviewed: SM Approved: GC



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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

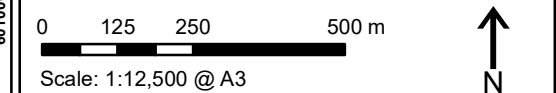


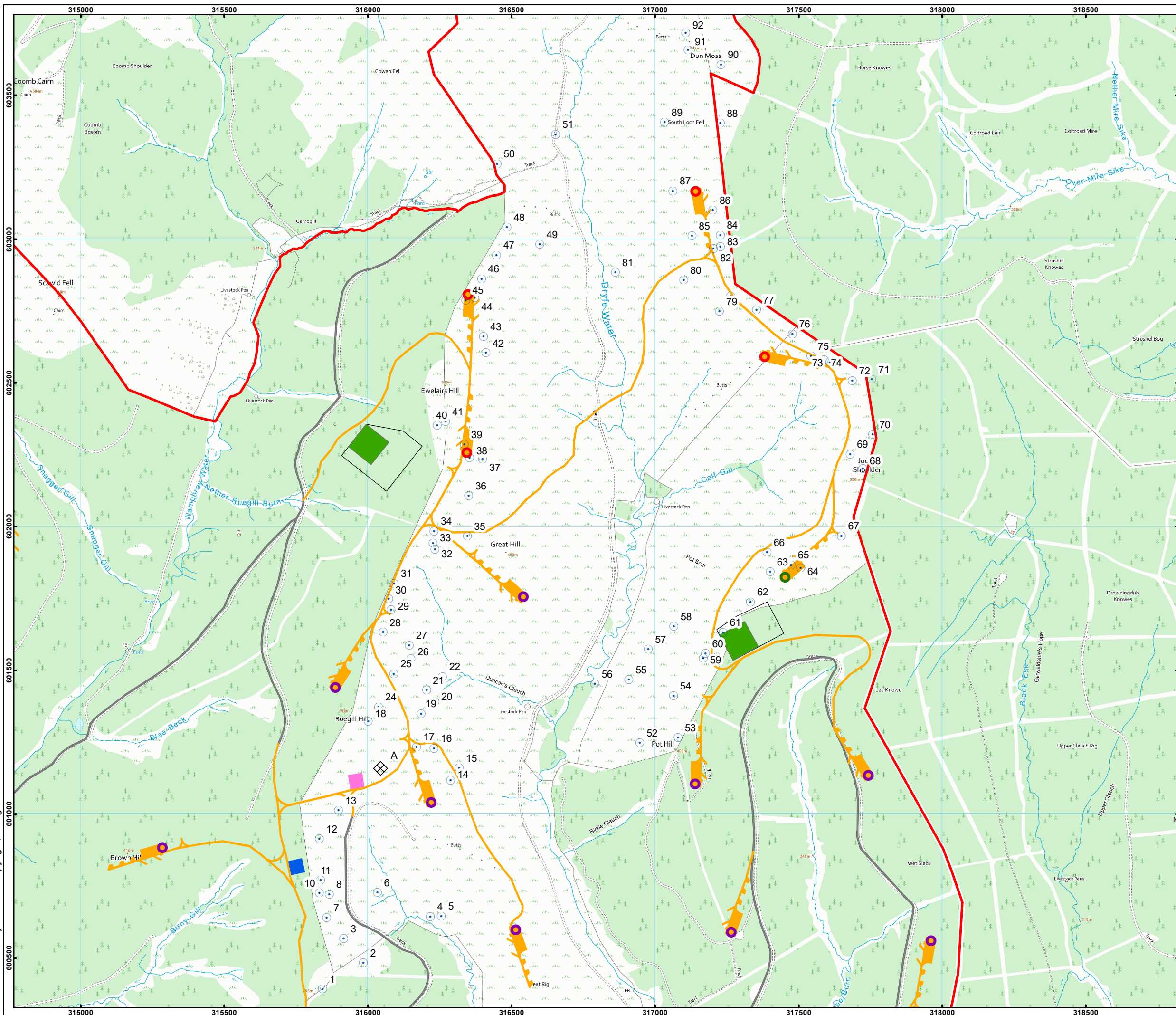
Figure 8.3d - Target notes for north eastern area with Rue Gill to Pot Hill

Date: 06/08/2020 Ref: 374-200806-7391-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

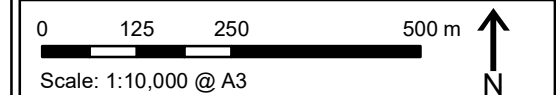
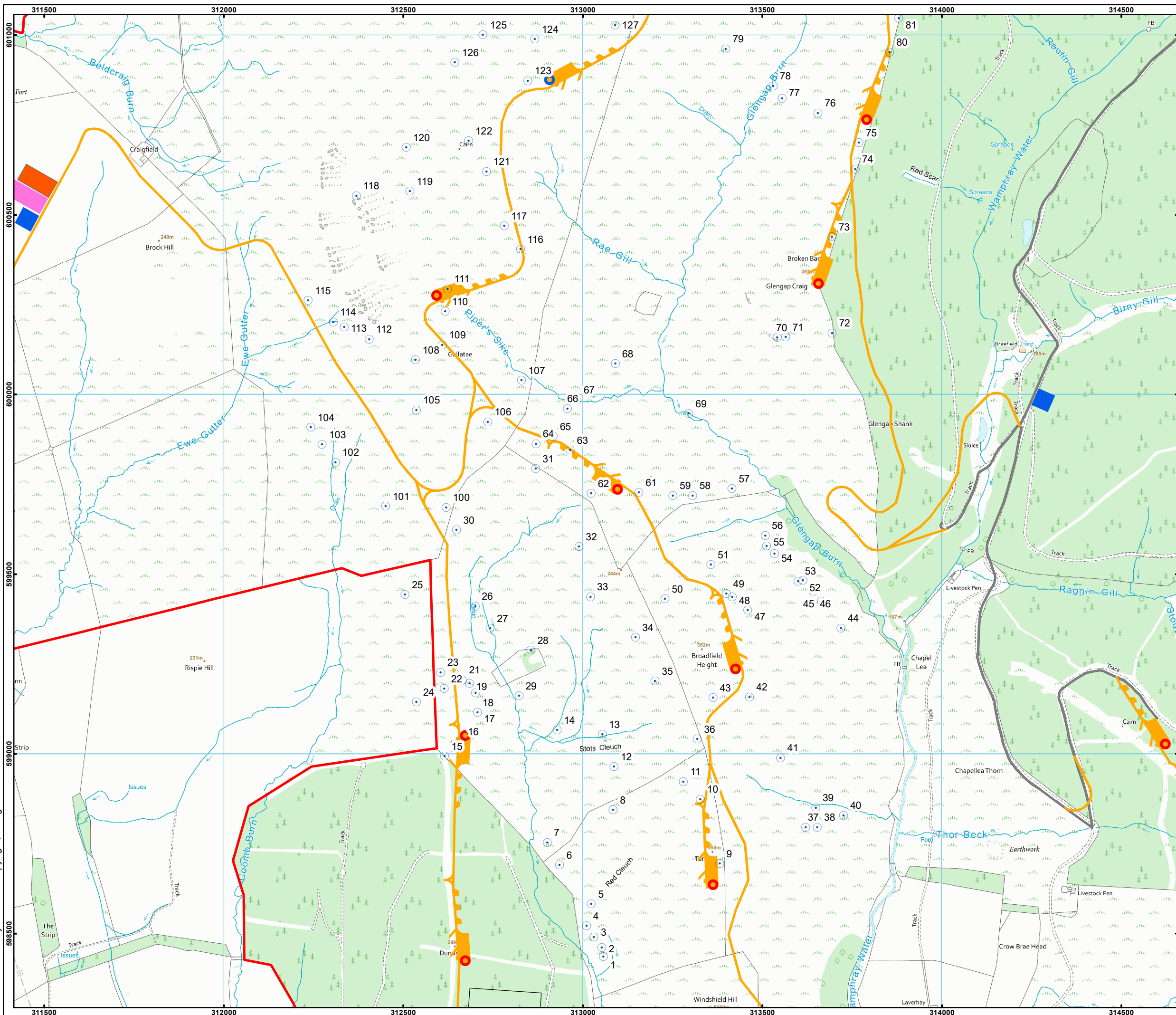


Figure 8.3e - Target notes North western area including Dundoran Plantation

Date: 06/08/2020 Ref: 374-200806-7392-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

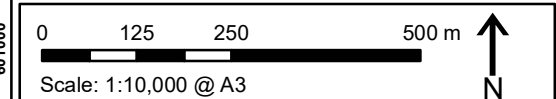


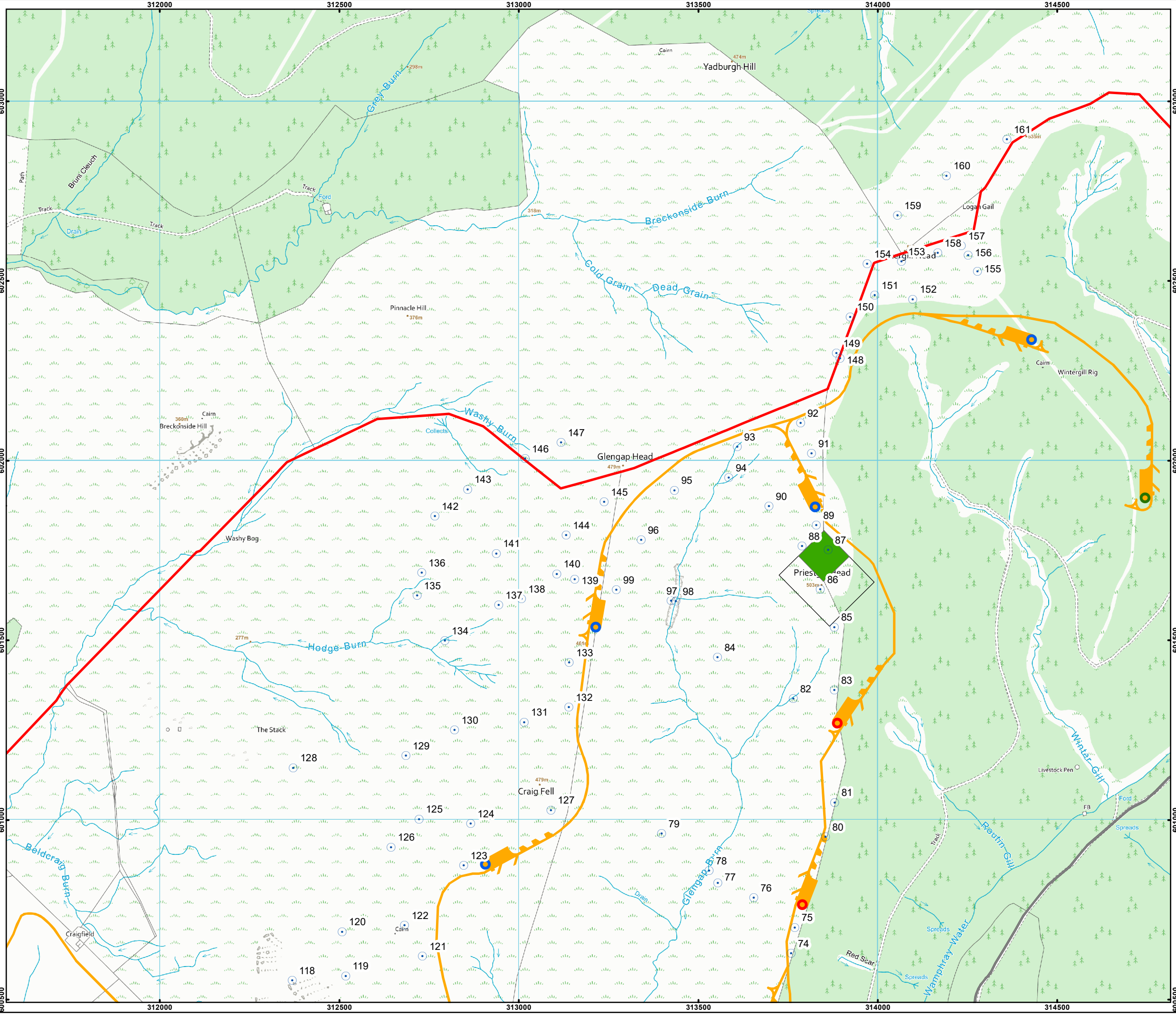
Figure 8.3f - Target notes North western area including Dundoran Plantation

Date: 06/08/2020 Ref: 374-200806-7393-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

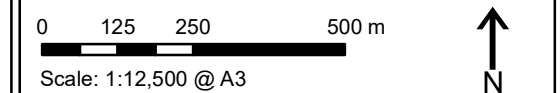
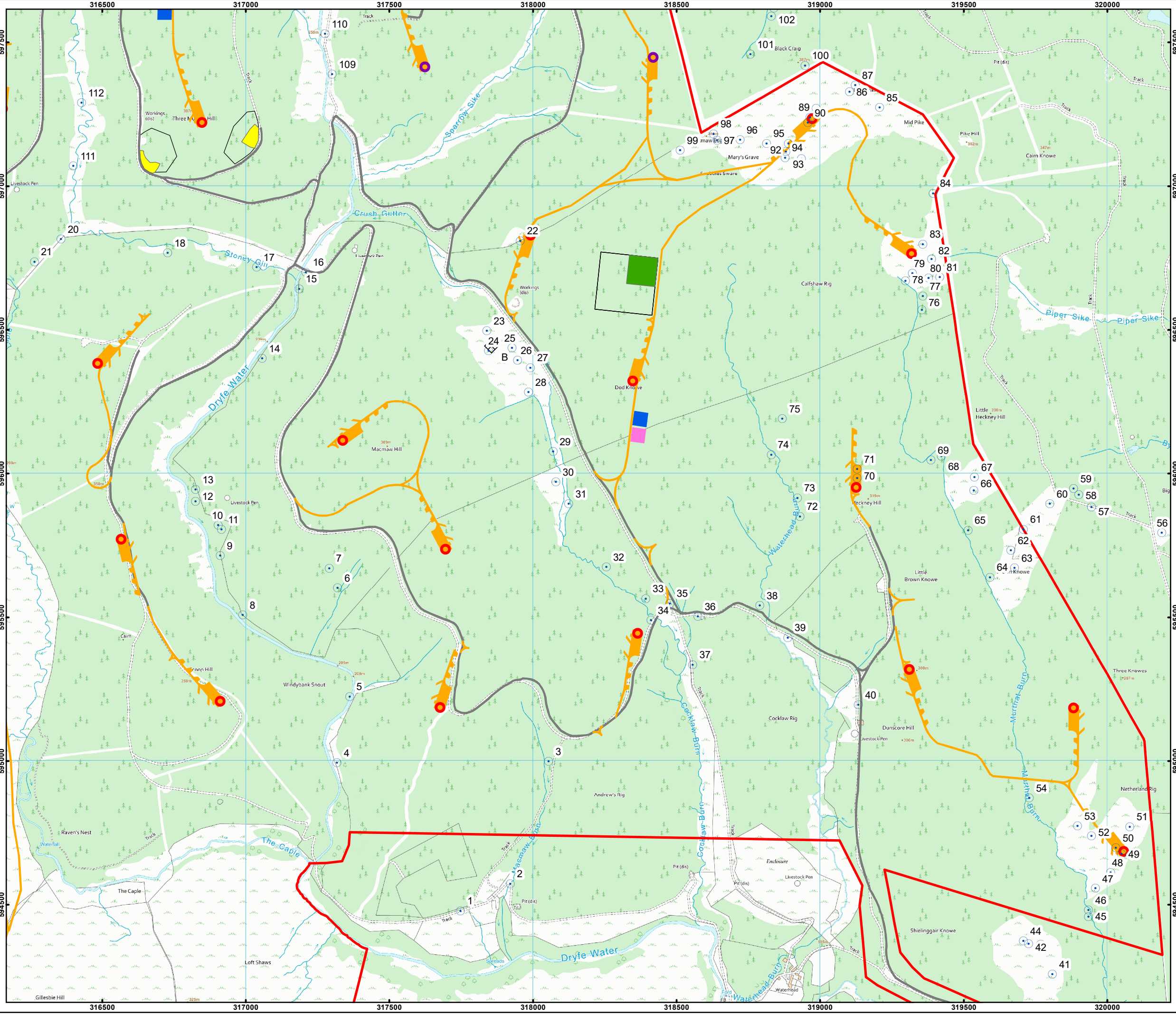


Figure 8.3g - Target notes for south-eastern forest area including Silton Forest

Date: 06/08/2020 Ref: 374-200806-7394-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

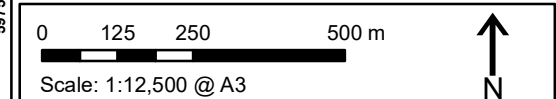


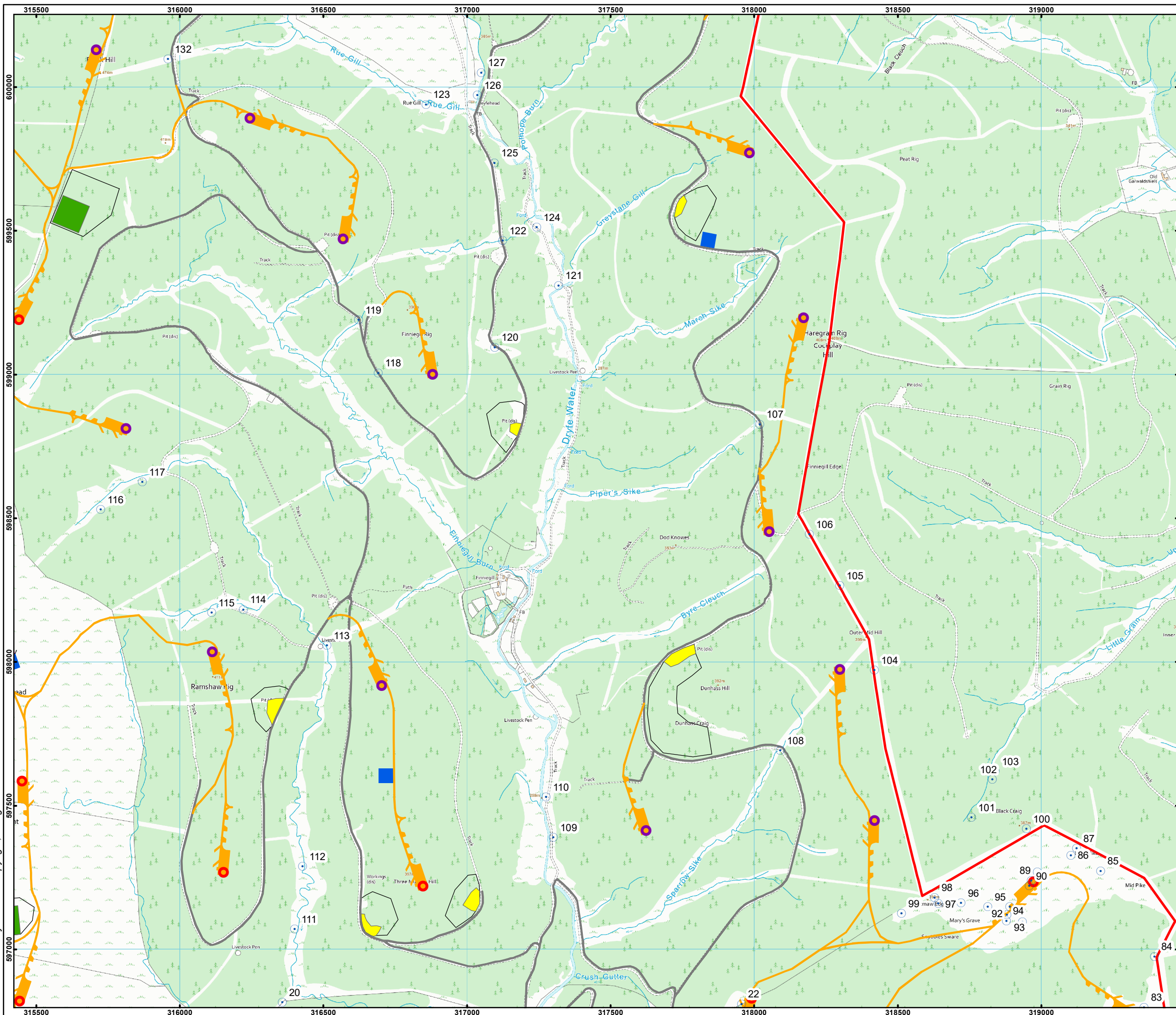
Figure 8.3h - Target notes for south-eastern forest area including Silton Forest

Date: 06/08/2020 Ref: 374-200806-7395-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

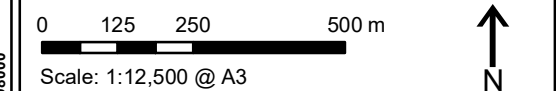


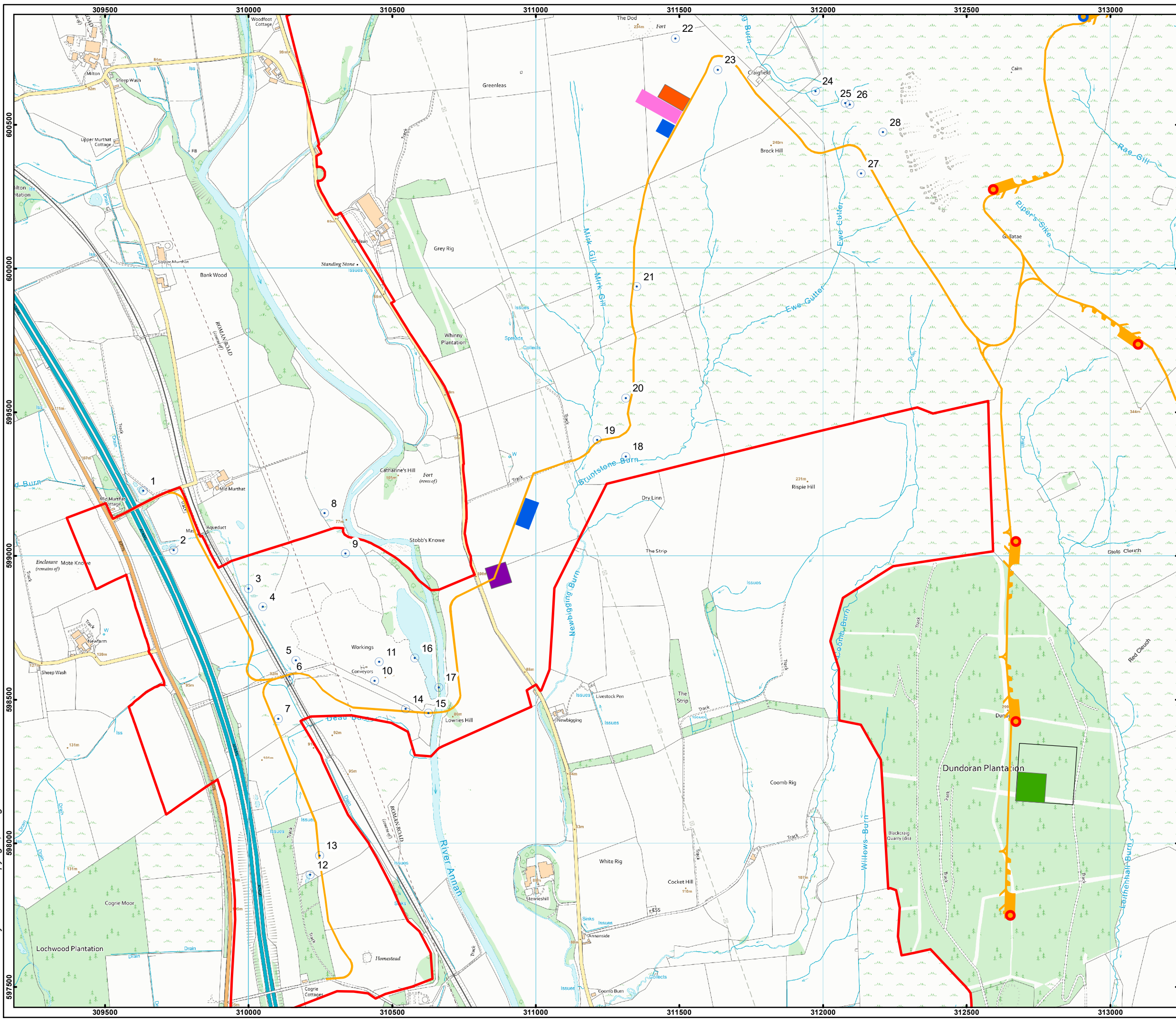
Figure 8.3i - Target notes for additional areas survey in 2020

Date: 06/08/2020 Ref: 374-200806-7396-B  
Produced: DR Reviewed: SM Approved: GC

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

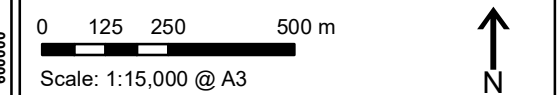
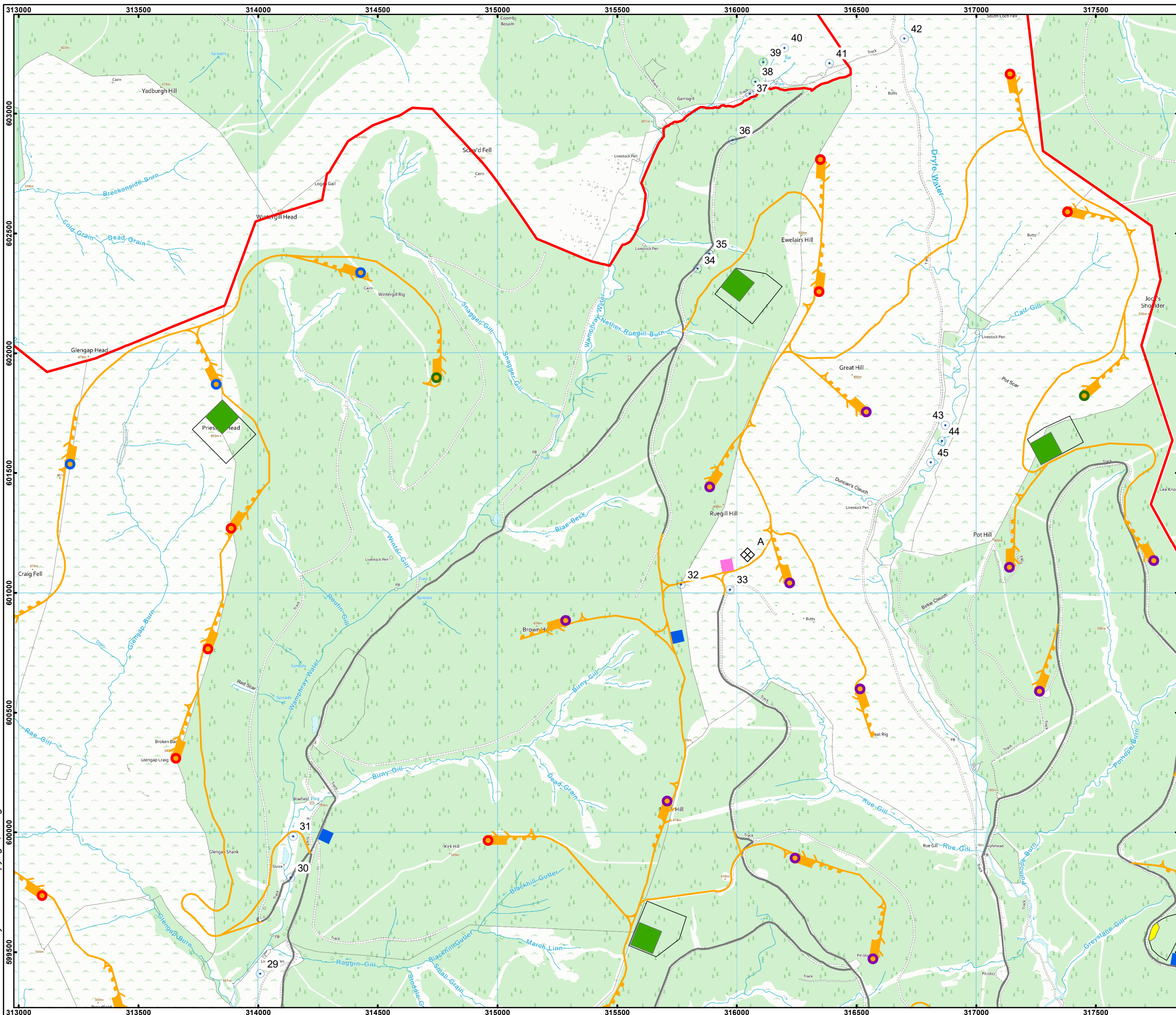


Figure 8.3j - Target notes for additional areas survey in 2020

Date: 06/08/2020 Ref: 374-200806-7397-B  
Produced: DR Reviewed: SM Approved: GC





# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Target Note

Notes: N/A  
Revisions: N/A

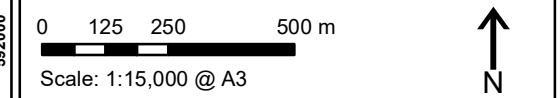
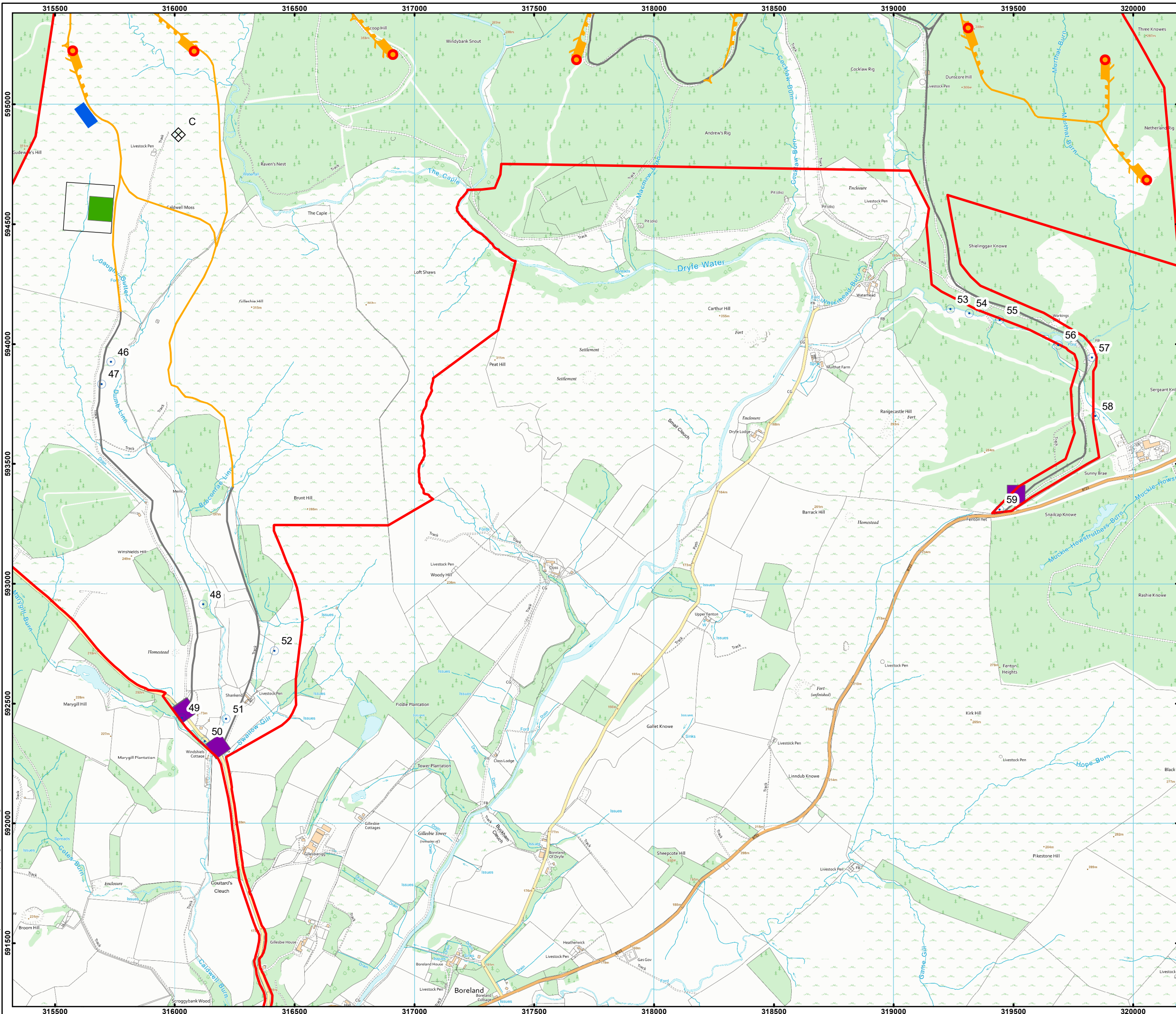


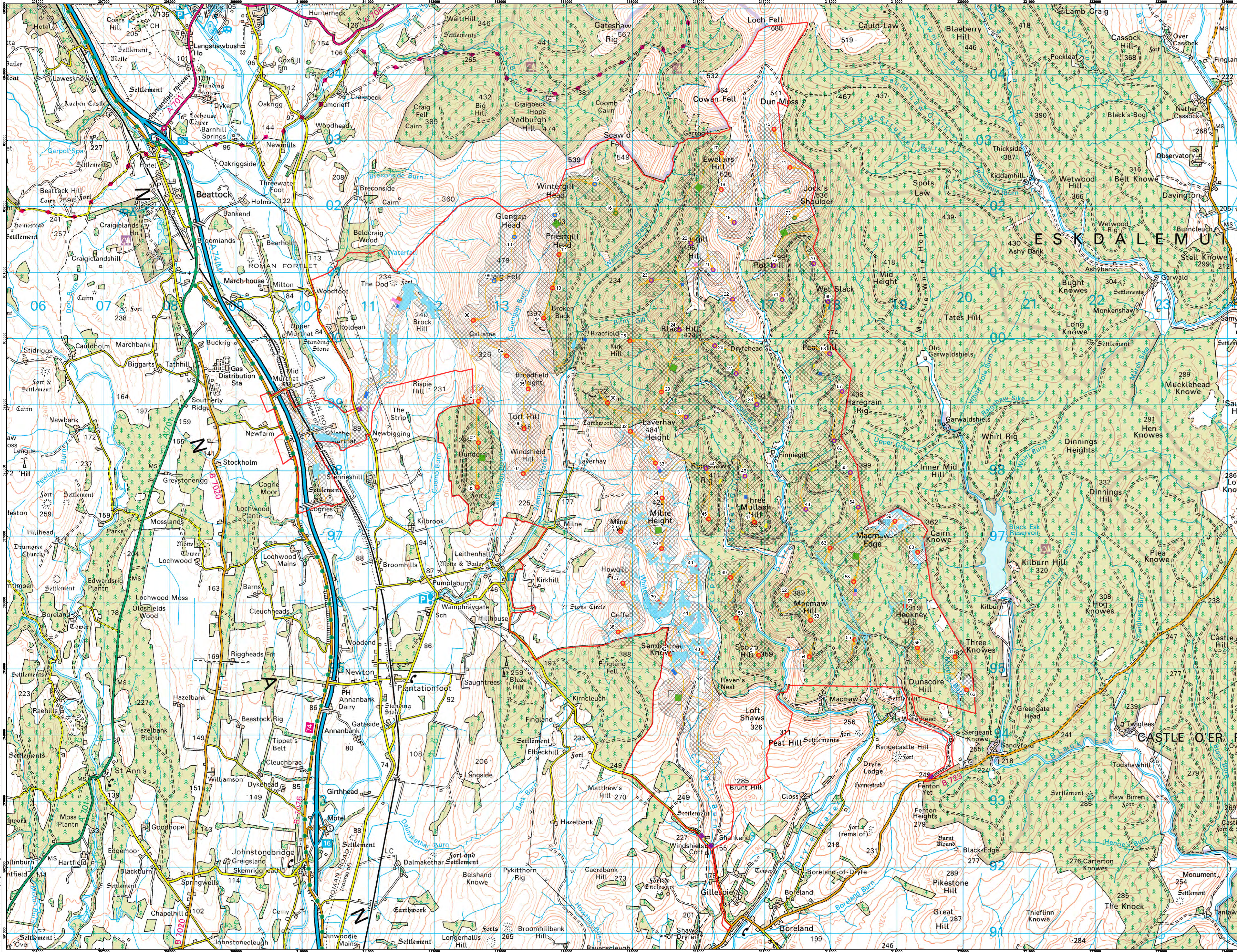
Figure 8.3k - Target notes for additional areas survey in 2020

Date: 06/08/2020 Ref: 374-200806-7398-B  
Produced: DR Reviewed: SM Approved: GC





- Legend**
- Site Boundary
  - Wind Turbine (180m to tip)
  - Wind Turbine (200m to tip)
  - Wind Turbine (225m to tip)
  - Wind Turbine (250m to tip)
  - Permanent Met Masts
  - Access Tracks
  - Site Entrance
  - Existing Access Tracks to be Upgraded
  - Substation & Control Room
  - Substation & Control Room Construction Compound
  - Temporary Construction Compound
  - Borrow Pit
  - Existing Quarries or Borrow Pit
  - Borrow Pit Area of
  - GWDE Buffers
- GWDE Score**
- 2
  - 1



Notes: N/A  
Revisions: N/A

Scale: 1:25,000 @ A1

**Figure 8.4 - GWDE's Within Excavation Buffers**

Date: 06/10/2020 Ref: 374-200428-7286-B  
Produced: DR Reviewed: RE Approved: GC

**community windpower**

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# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Transect 1 Gillesbie
- Transect 2 Laverhay
- Transect 3 Dundoran
- Transect 4 Rue Gill
- Transect 5 Three Mullach
- Transect 6 Silton
- Remote Detectors

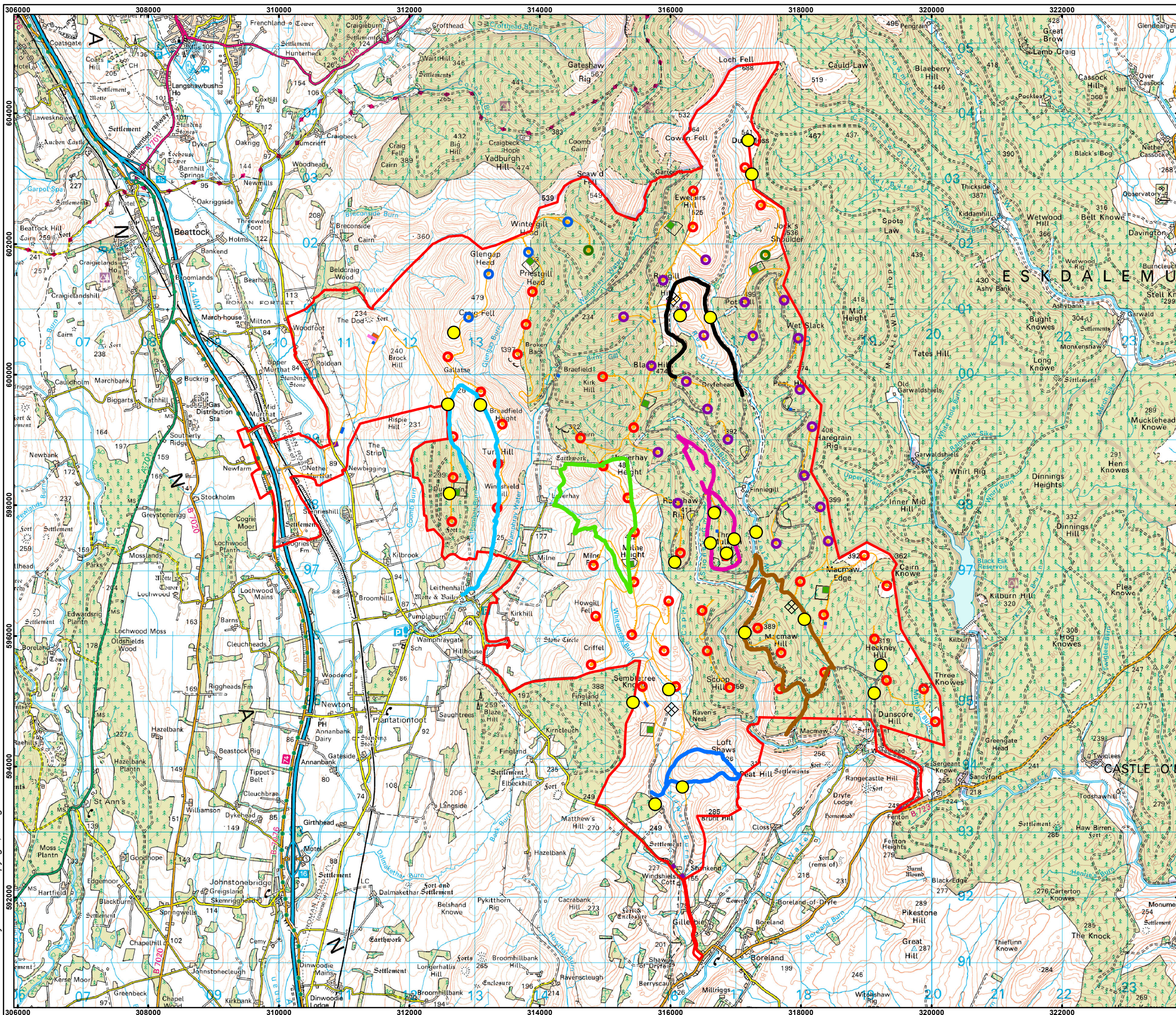
Notes: N/A  
 Revisions: N/A  
 Turbine Layout: 374-191212-9018



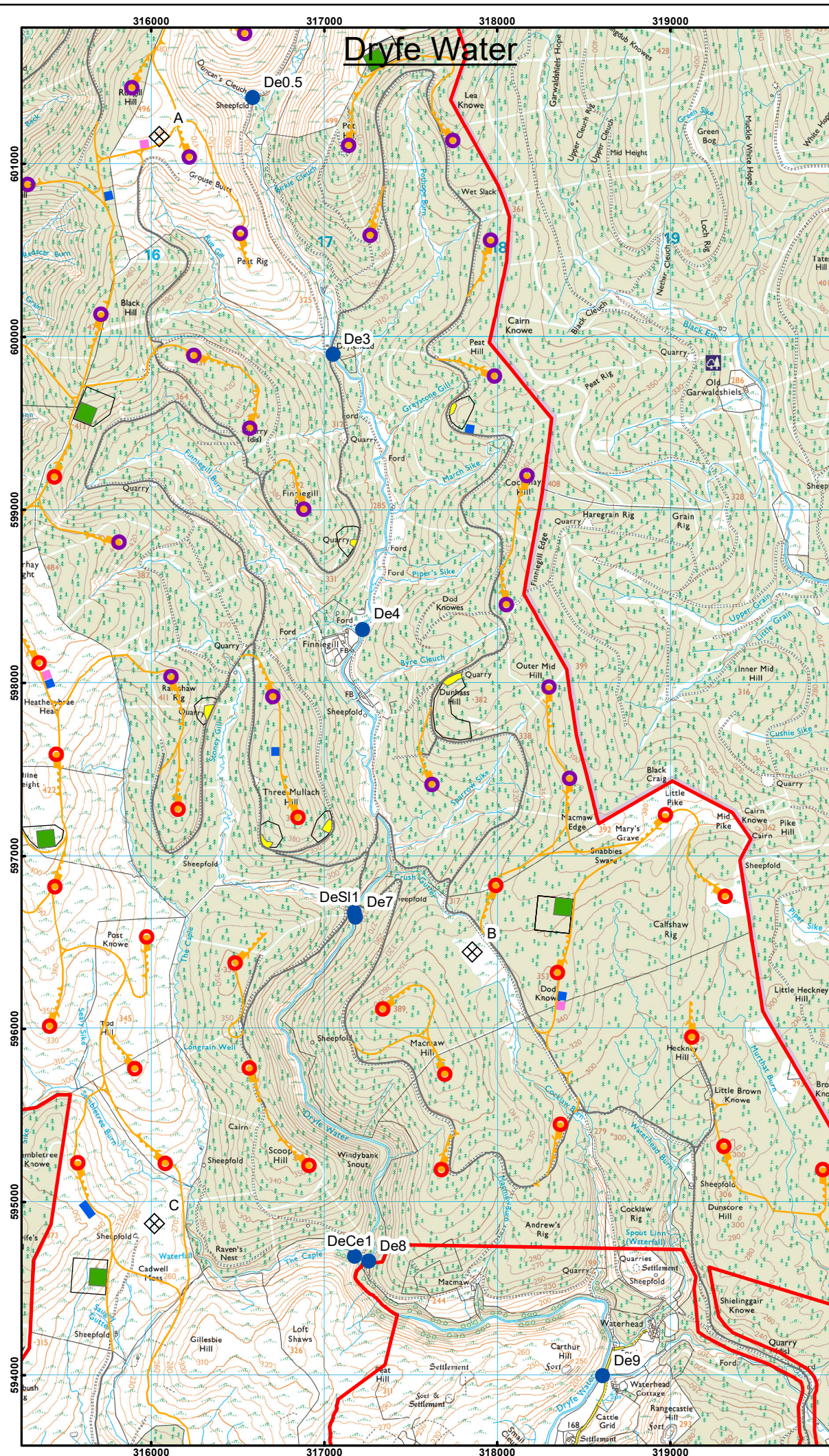
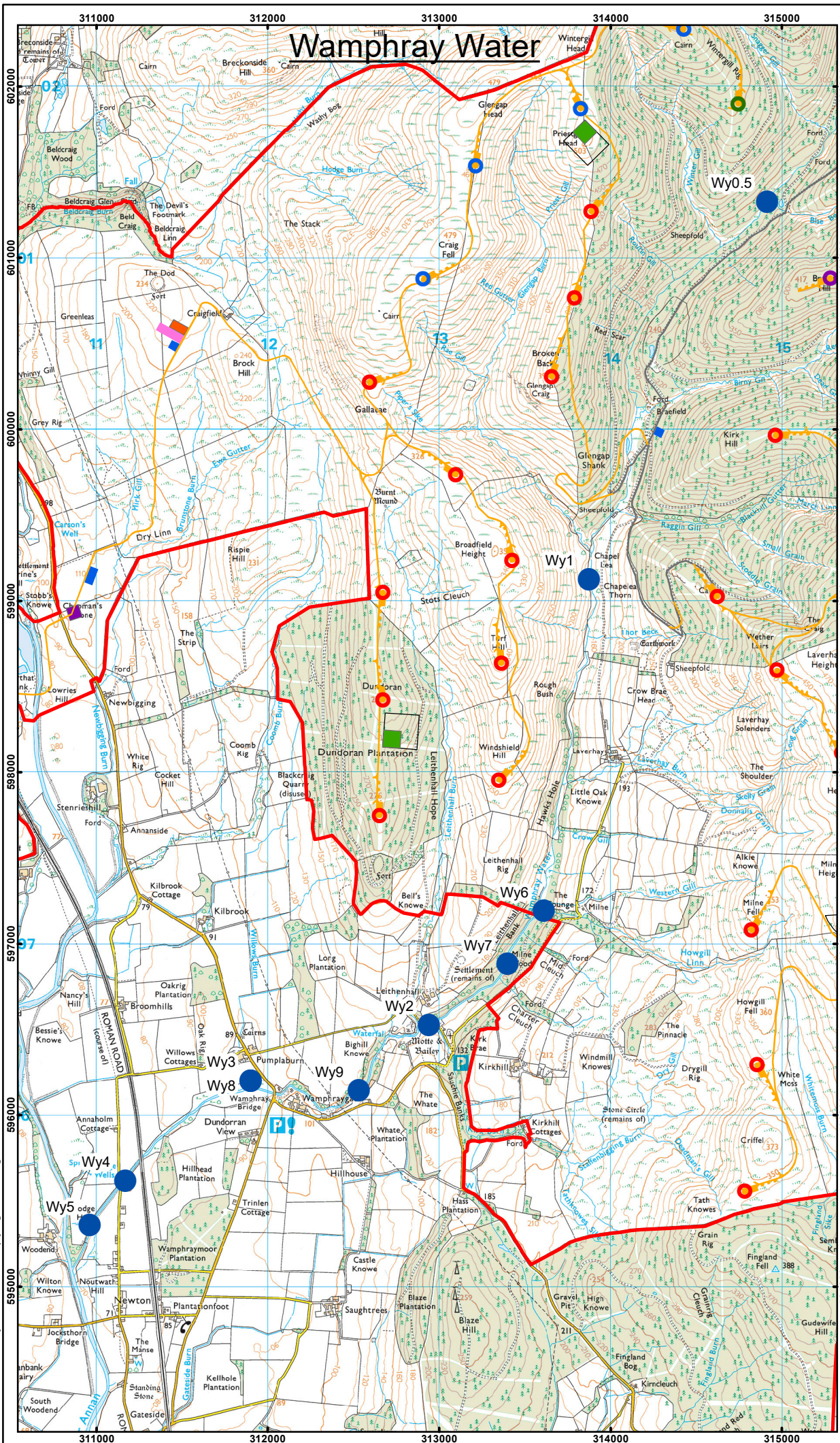
**Figure 8.5 - Routes of Bat Transects and Locations of Remote Detectors**

Date: 03/08/2020 Ref: 374-200803-7383-B  
 Produced: DW Reviewed: DR Approved: GC

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### 374 Scoop Hill

- Legend**
- Site Boundary
  - Wind Turbine (180m to tip)
  - Wind Turbine (200m to tip)
  - Wind Turbine (225m to tip)
  - Wind Turbine (250m to tip)
  - Permanent Met Masts
  - Access Tracks
  - Site Entrance
  - Existing Access Tracks to be Upgraded
  - Substation & Control Room
  - Substation & Control Room Construction Compound
  - Temporary Construction Compound
  - Borrow Pit
  - Existing Quarries or Borrow Pit
  - Borrow Pit Area of Search
  - Fish Survey Location

Notes: N/A  
Revisions: N/A

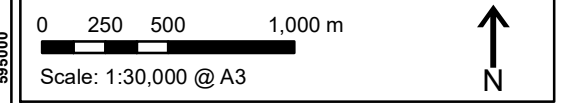


Figure 8.6 - Fishing Survey Locations

Date: 07/08/2020 Ref: 374-200108-7216-B  
Produced: RE Reviewed: DR Approved: GC

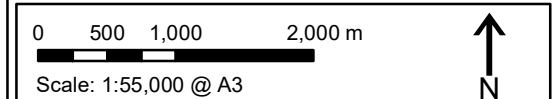


# 374 Scoop Hill

## Legend

- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Otter Evidence

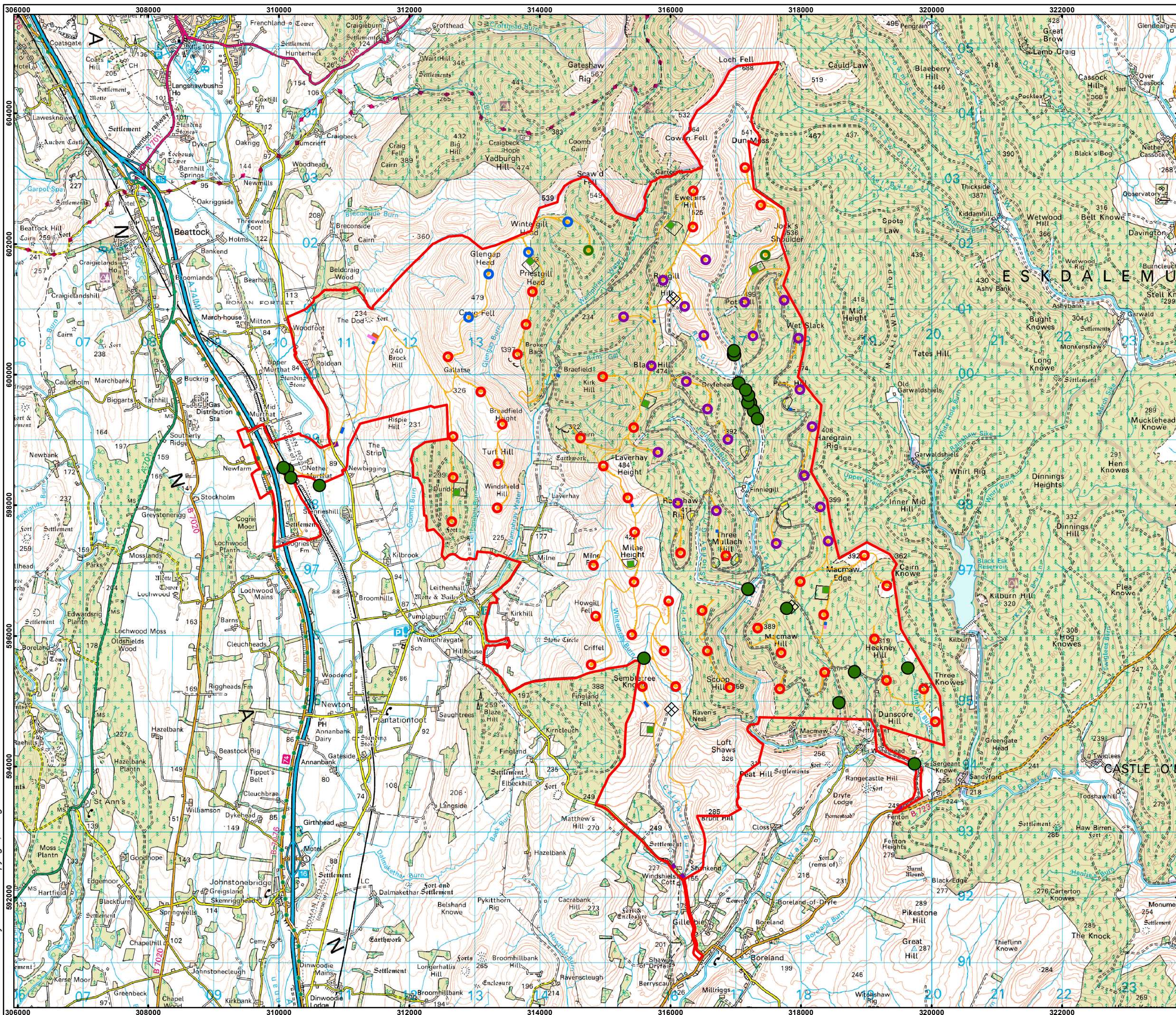
Notes: N/A  
 Revisions: N/A  
 Turbine Layout: 374-191212-9018



**Figure 8.7 - Otter Evidence (Non-Sensitive)**

Date: 03/08/2020 Ref: 374-200803-7384-B  
 Produced: DW Reviewed: DR Approved: GC

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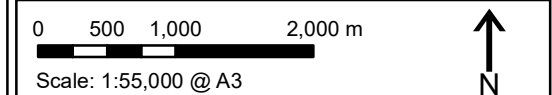


# 374 Scoop Hill

## Legend

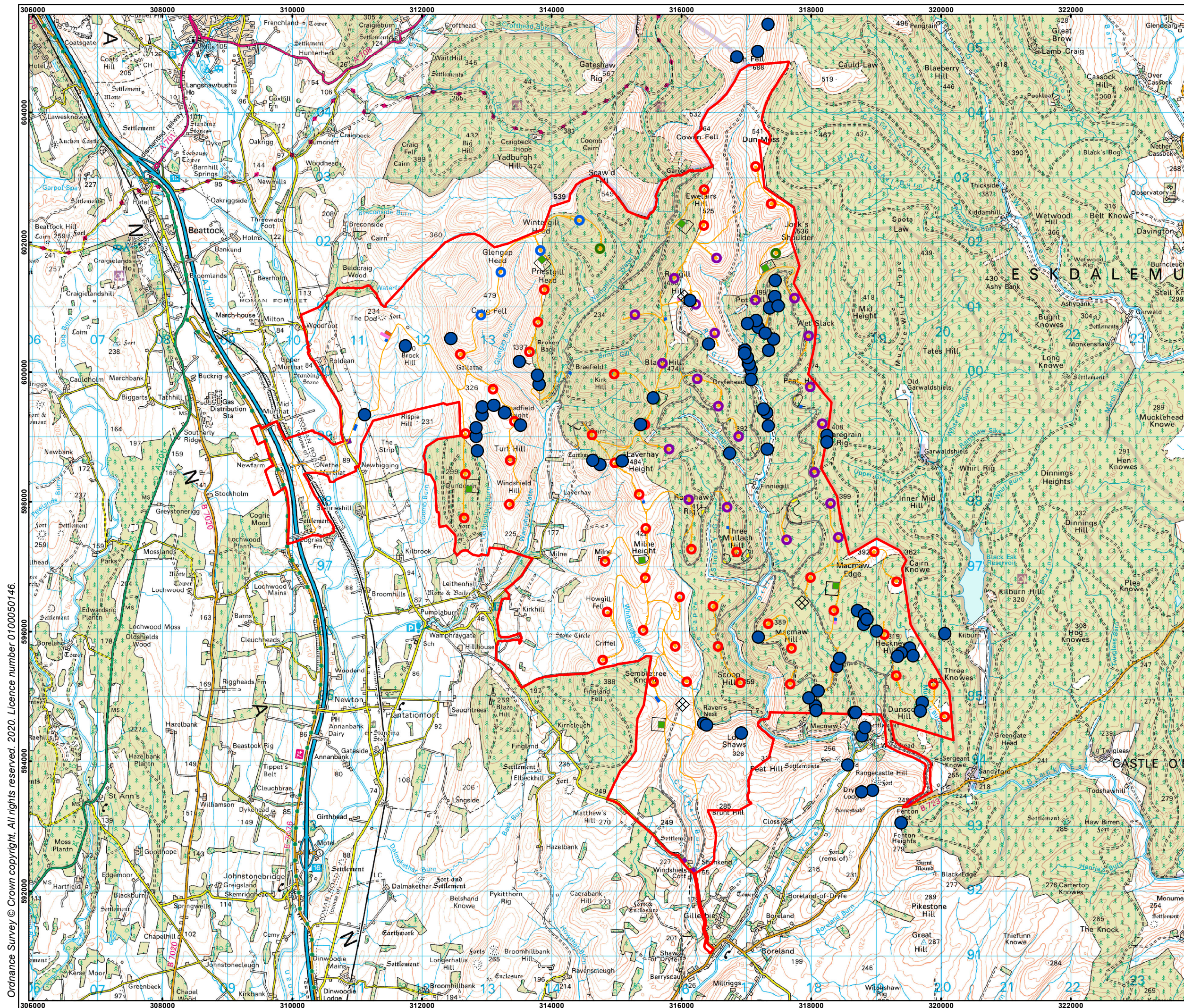
- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Badger Evidence

Notes: N/A  
 Revisions: N/A  
 Turbine Layout: 374-191212-9018



**Figure 8.8 Badger Evidence (Non-Sensitive)**

Date: 03/08/2020 Ref: 374-200803-7385-B  
 Produced: DW Reviewed: DR Approved: GC



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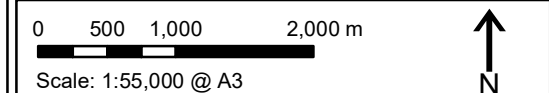


# 374 Scoop Hill

## Legend

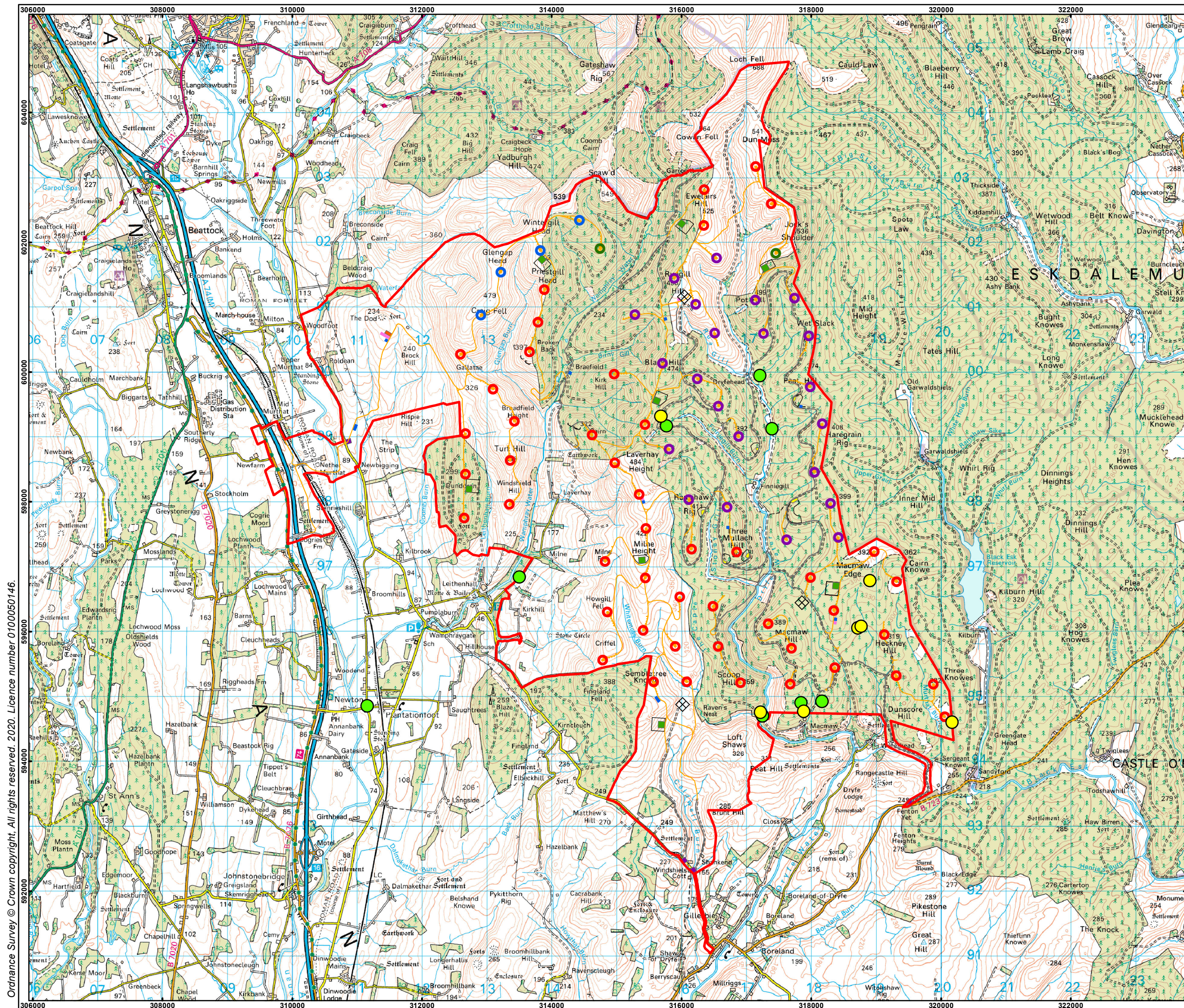
- Site Boundary
- Wind Turbine (180m to tip)
- Wind Turbine (200m to tip)
- Wind Turbine (225m to tip)
- Wind Turbine (250m to tip)
- ◇ Permanent Met Masts
- Access Tracks
- Site Entrance
- Existing Access Tracks to be Upgraded
- Substation & Control Room
- Substation & Control Room Construction Compound
- Temporary Construction Compound
- Borrow Pit
- Existing Quarries or Borrow Pit
- Borrow Pit Area of Search
- Pine Marten
- Red Squirrel

Notes: N/A  
 Revisions: N/A  
 Turbine Layout: 374-191212-9018



**Figure 8.9 Red Squirrel and Pine Marten Evidence (Non-Sensitive)**

Date: 03/08/2020 Ref: 374-200803-7386-B  
 Produced: DW Reviewed: DR Approved: GC



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